The Chemical Age

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Misuse of Farm Chemicals

THE alarming feature of the toxicity to human beings of DNOC (3:5 dinitro-*ortho*-cresol), of which tragic evidence was given by the sudden deaths of two agricultural spraying workers (page 7 this issue), is the paucity of medical knowledge of biological aspects, and hence of the remedial measures when users have neglected the elementary safeguards. It needs little reflection to appreciate that in the conditions in which DNOC and a number of other toxic agricultural substances will often be used the simplest precautions to render them harmless will inevitably be disregarded at some time or other. Agricultural workers cannot be supervised as effectively as factory workers, and when there is negligence medical science, it would appear, is helpless to avert the results. These, as the facts of the Yorkshire fatalities show, may be sudden and disastrous.

Those are among the reasons why this event was given by some national newspapers a "scare" rating and corresponding treatment, from which many who know nothing about DNOC—or DNC, as it is commonly called by users—may infer that the stuff can be classed in respect to its danger to human beings with the powerful arsenicals or the cyanide of potassium which farmers use to destroy wasp nests. This is demonstrably nonsense, but it would be surprising if that belief has not taken root in some quarters.

The calamitous possibilities of DNOC were not less known than were the poisonous effects of the cresol disinfectants, the drinking of which used once to figure fairly frequently in the evidence of suicide cases. It is generally agreed that there have now been six fatalities, including those in Yorkshire, which can with fair certainty be attributed to the use of DNOC in agriculture. There is no element of unknown hazard here, excepting the generally innocuous character of the substance, like that of a host of other "poisons" which 99.9 per cent of their users employ with no ill effect.

DNOC is not new. During approximately 15 years it has been in common use as a winter wash for fruit trees it has established a reputation as a harmless and effective insecticide, used in a concentration only one-sixth to one-tenth as strong as the solution employed for weed killing. Its use against weeds has been widespread only for about six years, during which its

On Other Pages

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usefulness has been so fully established that very few farmers would be willing to dispense with it. Too many, unfortunately, do not appreciate that there is a very different element of risk in using a weak concentration in winter conditions, when absorption through the skin is much less likely, and spraying a much stronger solution when summer heat makes the wearing of stuffy protective clothing and rubber boots an acute hardship. Reassured by the knowledge that a good deal of wetting with DNOC has produced no noticeable effect, the spray operator is subjected to the strongest possible temptation to take a chance. It has to be recognised that this sort of occasional foolhardiness is likely to persist as long as this and a large and increasing group of agricultural chemicals are used and the conditions in which they are distributed and applied will have to be adjusted to minimise the possibility of carelessness. A responsible and realistic attitude to a somewhat similar danger, of a graver kind because it could damage the many who consume a crop, not only those who tend it, is the stringent control of the use of the organic phosphorus insecticide Pestox 3. That, however, is a relatively simpler problem because of the more definite nature of the hazard associated with a phosphorus compound, which rules out its distribution to all and sundry. DNOC, on the other hand, can be had by anyone and so also can a lengthening list of chemicals for field or garden, several of which are conspicuously more hazardous than dinitro-*ortho*-cresol. To prohibit their use would be a stupidly retrograde step, assuming that it were possible, comparable to grounding all civil aircraft to prevent the destruction which results—far more frequently—from air accidents.

The possibility now arises, however, that compulsory safeguards will have to be established to avert the results of ignorance or reckless use of the newer agricultural chemicals. That the Ministry of Agriculture is aware of the need for action is indicated by the recent publication of warning notices to users of DNOC and the phosphorus formulations, and the current decision to call a conference on July 11 of all the interests concerned.

Notes and Comments

European Coal and Steel

AMID the political uproar here which has followed the recent somewhat abrupt presentation to the world of the Schuman plan to co-ordinate European production of coal and steel comparatively little attention seems to have been paid to the likely effects of some such agreement on British steel and coal programmes, whether the Government participates or abstains. It is hard to avoid the conclusion that the U.K. approach to this proposal, the need for which has been foreshadowed by the unco-ordinated "steel drive" in most countries since the war, would have had a more rational background but for the Socialist conviction that coal and steel in Britain are actually or potentially departments of State. That belief appears to have inspired at least some of the repugnance evidently felt by some Government supporters to the possibility of surrendering what is called "national sovreignty" in this connection.

A Natural Development

WHATEVER the merits and defects of a "supra-national" body influencing the development of the numerous plans to overcome an apparently chronic steel shortage, it seems unlikely now that abstention by Britain alone would divert the aims of France and Germany and offset the general desire to see a closer understanding between them. The Schuman plan, moreover, may be regarded as an inevitable result of the grossly unbalanced resources of coal and of iron ore which will enforce some scheme of rationalisation, whether the French plan is accepted or not. Countries deficient in coking coal—the common European disability—or of iron ore and manganese have already shown evidence of their determination to remedy their troubles by the obvious exchange methods. The best function of the Schuman plan would be to facilitate that natural process and ease the tensions which are bound to arise if such factors as the mounting production of the Aachen and Ruhr coalfields —expected to reach 400,000 tons daily this autumn—are not treated realistically. The inevitability of what is now being proposed from France might well have been foreseen. There would then have been less prospect of a divorce of British coal and steel from the European economy, which is now an unwelcome possibility.

Themes of the CRL

SURE, if unspectacular, advances upon the work shown in 1949 were seen by the Press when they visited the DSIR Chemical Research Laboratory at Teddington on June 27. Perhaps the most interesting exhibits this year were those of the microbiological department, which is showing vigorous leadership in the field of non-pathogenic cultures for the use of industry. One of the predominant themes in this department continues to be the study of sulphate-reducing bacteria and the stimulants and inhibitors of their growth, with the addition of selenates for competitive inhibition. Also under survey are sulphur-oxidising bacteria and the internal and external corrosion of buried ferrous pipes.

Industrial Bacteria

BACTERIA are being increasingly used in many industrial processes, from the production of yoghourt to the manufacture of solvents. The Chemical Research Laboratory, recalling this, is reminding industry of its own national collection of industrial bacteria, which was founded early this year. It took over the non-pathogenic cultures held by the National Collection of Type Cultures at Colindale and now houses some three hundred and fifty types, with the expectation of a considerable increase as the collection becomes more representative of the needs of industry.

The laboratory will maintain any organism which has ceased to be of interest but which may be wanted later. It frequently happens that a particular organism is destroyed when it has fulfilled its temporary purpose and yet may be required in the future at short notice. The laboratory will also maintain any duplicate organisms. Most of the non-pathogenic bacteria supplied by Colindale can be obtained and CRL will try to procure any type of non-pathogenic culture which it does not hold itself. In time, it is hoped that the collection will become comprehensive by obtaining cultures from other laboratories in this country and abroad, with particular emphasis given to assay organisms.

"The State Can't Do It"

WHILE few chemists in these days have the leisure to consider at length the eventual effects of national policy upon social and economic affairs, some, among the guests of the Society of Individualists at an anniversary luncheon in London on June 22, heard such trenchant and reasoned criticisms of current affairs that they had every cause to abandon the common attitude of neutrality. Speakers of the calibre of Dr. C. K. Allen and Sir William Darling gave the most convincing account of the principle of allowing full scope to the individual to make the best use of all the energy and talents he possesses, a practical aspiration which nearly all scientific workers share and all the more successful achieve for themselves. The movement, which grew up round the nucleus of the Individualist Bookshop, was celebrating its 25th birthday and the 75th birthday of Sir Ernest Benn, one of its founders and its most formidable protagonist from its earliest days. He gave the Individualists a revealing picture of the decline, since about 1910, of the nation-wide preference for managing ones own affairs and making the most of individual gifts, which in the sciences, incidentally, was the background of most of the significant advances. Notwithstanding the benevolent participation of some Government departments in several sections of science and technology, the outcome has not in the least invalidated Sir Ernest Benn's declaration that "The State can't do it". There have been few more conspicuous examples of fruitful individualism that the former secretary of the DSIR. His tradition of scope and responsibility for individual workers continues to provide most of the impetus of wide-ranging research projects.

Oil Shale

SCIENTISTS are coming from Europe, the British Commonwealth and the U.S.A. to meet their British counterparts at the Second Oil Shale and Cannel Coal Conference in Glasgow during the first week of July. This conference, organised by the Institute of Petroleum, will be held at the Royal Technical College from July 3-7. Nearly 50 technical papers will be presented and discussed. Subjects cover the geology, mineralogy, and mining of oil shale and cannel coal, oil shale retorting, refining of shale oil and uses of by-products, including topical material concerned with some of the detergents which Scotland is producing. A programme of social events has been arranged to cover the intervals between the technical sessions, including a dinner and dance at the Central Hotel, Glasgow, a day visit to Scottish Oils, Ltd., a number of bus tours and a civic reception by Glasgow Corporation. The start of the conference coincides with the official opening of the new "Young" research laboratories in the technical college. These commemorate James Young, who figured prominently in the establishment of the Scottish shale oil industry. A reception has been arranged by the governors of the college for the members of the conference, at which Dr. W. M. Cumming, O.B.E., will deliver the "Young" centenary lecture, after which the new research laboratories will be officially opened.

Cortisone Distribution in U.S.A.

The first widespread distribution of cortisone for control of rheumatic diseases was made in the U.S.A. last week when the drug was made available to hospitals.

CHEMISTRY & METALLURGY AT HARWELL

Study of Materials in Novel Conditions

MANY interesting scientific problems have been tackled and considerable progress made at Harwell since the last Press visit to the Atomic Energy Research Establishment nearly two years ago. The important part played by chemical engineering and metallurgy during that period was emphasised at a Press visit last week which served to reveal some of these advances.

A primary task at the moment is to make possible the economic use of low-grade ores and both the chemical laboratories and the metallurgical department are engaged in experiments with regard to extraction.

The metallurgists are also studying new reactor materials, and encouraging progress has been made in the production of beryllium shapes. Another potentially useful metal is zirconium, but this is difficult to prepare sufficiently pure. The chemists have, however, worked out a very promising method for doing this, which is capable of development on a production scale.

Liquid metals may be used in new reactors, and the engineers are studying the heat transfer problems at the very high transfer rates that will be required. They and the chemical engineers are also studying with test rigs the problems of circulating liquid metals in closed circuits.

It has been found that chemical reactions occur more readily in the conditions inside a pile. Care has therefore had to be taken lest graphite, for example, oxidises too readily and disperses in the cooling air; whenever two different materials are used in contact their reactions have to be tested in these conditions.

Interesting Scientific Problems

The effects of the bombardment which goes on inside a pile on the mechanical, electrical and thermal properties of all materials which will be used in future in reactor construction have been studied. There are many interesting scientific problems here. For example, when quartz is exposed inside a pile it is turned from a crystalline substance into a glass. When diamonds are exposed in a pile they become coloured.

The chemists are also studying the effects of pile radiations on the disarrangement and rearrangement of molecules. If a mixture of benzol and water is irradiated, phenol-dihydro-oxy-benzene and other complex products are produced.

The graphite used in the construction of a pile is itself an important material, acting as a moderator, slowing down neutrons to the velocities needed for efficient operation. Heavy water and beryllium are other examples, but there are engineering and supply problems which seriously limit their use. The graphite required for a nuclear reactor must not contain impurities which absorb neutrons and must be robust if it is to form part of the reactor. Research to improve graphite technology is continuous.

Chemical Engineering

Solvent extraction of inorganic materials is another problem of the chemical engineering section. For proper understanding of the manner in which material is transferred from an aqueous solution into an organic solvent it is necessary to know something of the behaviour of liquid droplets in passing through another liquid.

In the solvent process laboratory apparatus is designed so that photographs can be taken of the droplets entering and leaving a column packed with rings. The photographs are taken with an exposure of 200 microseconds and after development are examined to determine the average volume and surface area of the droplets.

Many inorganic materials can be extracted from their aqueous solution in organic solvents. Ether extraction of uranium salts from aqueous solution has, for example, long been known and made use of in the purification of uranium.

In the development of nuclear energy for industrial use, metallurgical research is faced with many problems of high temperature engineering projects and several problems peculiar to nuclear reactors.

The Press party was shown an argon arc furnace, in which metals of the highest melting point can be melted. The unique characteristic of this furnace is that no special containers or crucibles in which to melt the metal are required, and contamination of the melt is thus avoided.

A second exhibit showed an unusual method of measuring small strains (of the order of one ten-millionth) in metals. Essentially, a constant flow of air is main-

(*continued overleaf*)

Aluminium Works Explosion

Experimenting with Carbon Tetrachloride

A VERDICT of "Accidental death" was returned at the inquest last week, at Banbury (Oxon), on John Parker Bell and Albert Payler, employees at the works of the Northern Aluminium Co., Ltd., who were killed as the result of an explosion there on May 18. The coroner (Mr. W. P. Haines) commended Mr. Jack Brown for his brave action in rescuing, at the risk of his own life, a third man, Mr. Charles Clack, from the burning building.

A chemist at the works, in evidence, stated that his department was experimenting for the first time with carbon tetrachloride in connection with the making of aluminium paste when the explosion occurred. He had made extensive inquiries before the experiments to find if there was any chemical reaction between carbon tetrachloride and aluminium when dry, but found none.

Mr. S. H. Wilks, senior chemical inspector, H.M. Factory Inspectorate, said that although he and all authorities believed that the two substances together were passive, it had been found that a small pamphlet issued in the U.S.A. in 1945 stated that under certain conditions the substances would produce an explosion. He also mentioned an experiment carried out by the Director of Armaments Research, when the two substances exploded with the force of dynamite. In that experiment there had been used 80 per cent aluminium and 70 per cent carbon tetrachloride in a steel tube held down by 300-lb. weights and ignited by detonation. The steel tube was concertinaed against the wall of the explosion chamber. It was just such an explosion which happened in the experimental ball mill at the N.A.C., but what happened in the mill to fire the mixture he did not know.

The inspector said they had already notified all factories likely to deal with those two substances, and the makers of carbon tetrachloride were inserting a warning notice in their handbooks, and His Majesty's inspectors had been warned to stop all such processes.

CHEMISTRY & METALLURGY AT HARWELL

(*continued from previous page*)

tained between two parallel plates attached to the specimen under test. The pressure drop between the points of entry and exit of the air current to the plates depends upon the size of gap between the plates. Thus when the test specimen lengthens under load the gap between the plates increases by the same amount and the air pressure drop decreases. In one exhibit, the change in pressure was recorded by the indicator.

This technique has been developed for measuring small movements in metals under stress in a pile, where only remote methods of measurement are possible and conventional methods might be disturbed by pile irradiations.

Some of the special metals under investigation by the metallurgy division for thermal reactors were also on view. These included uranium, beryllium and zirconium.

Electrodepositors' Technical Society

The balance sheet and accounts of the Electrodepositors' Technical Society for the session ended August 31, 1949, shows a surplus of income over expenditure of £549 14s. 11d.

Safe Use of Agricultural Chemicals

A CONFERENCE to discuss the adequacy of the usual precautionary methods in the use of chemicals in agriculture has been arranged by the Ministry of Agriculture to take place on July 11.

This was announced on Tuesday following a discussion on the safety of operators between the Ministry of Agriculture and Fisheries and representatives of the TUC. The Ministry, recalling its warning notices of March 28 and April 13 on the precautions required in the use of DNOC and phosphorus weed-killers and insecticides, stated that further close attention had been given to the use of chemicals in general agriculture with reference both to their effects on the crops and the hazards to those using them.

Representatives of farmers, manufacturers and contractors have been invited to attend the conference.

Evans' Acquisition

Evans Medical Supplies, Ltd., has acquired the entire share capital of its Newcastle agents, Phillips Spencer, Dakers & Co., Ltd., which from July 1 will trade as a wholly-owned subsidiary. Mr. N. McQueen has been made general manager.

TWO KILLED BY DNOC

Jury Urges Expert Investigation

A JURY at a Richmond (Yorks.) inquest on June 21 recommended that the practice of using dinitro-ortho-cresol weed killer (DNOC) in hot weather should be the subject of consideration "by the highest authority."

The jury, inquiring into the deaths of two agricultural spraying operatives, heard a medical witness's opinion that no specific treatment existed for DNOC poisoning. The jury returned a verdict that death was caused by poisoning by dinitro-ortho-cresol received while the men were following their occupation and added the rider referred to.

The two men, Edward McFadden (25) and Thomas Brown (23), both of Blairgowrie, Perthshire, Scotland, were employed on seasonal work weed spraying for the Chafer Spraying Co., Ltd., Doncaster. They had been spraying DNOC at Sandwath Farm, Forcett, when McFadden died on the roadside and Brown died at the Darlington Memorial Hospital later the same day, June 6.

Dr. A. F. T. Ord, of Aldborough St. John, said that when he saw the body of McFadden lying by the roadside, the skin was yellow on his arms, body and head and his hair was yellow. Death appeared to have been instantaneous. Later, Brown was brought to his surgery. He was sweating profusely and his skin was yellow, but there was little to suggest he was acutely ill.

No Known Treatment

Dr. Michael Kelly, formerly of Darlington Memorial Hospital, said Brown's condition deteriorated rapidly after admission and it was probable that he had absorbed dinitro-ortho-cresol through the skin. Asked by Mr. O. H. Parsons, representative of the National Union of Farm Workers, whether there was any treatment in such a case, Dr. Kelly replied, "Probably not because there is not much known about it. There is no known way of being certain there is any specific treatment."

Mr. Richard R. Crute, representing Chafer Spraying Co., asked whether Dr. Kelly knew that the Ministry of Agriculture pamphlet stated the substance could be poisonous only if taken internally. Dr. Kelly: Our conclusion was that in the extreme heat of the day it probably could be absorbed.

Harry Roy Savage supervising engineer of the Chafer Spraying Co., said McFadden and Brown joined them on May 10 and were supervised on their first job on a farm after four days' training. They were both efficient and had had about 14 jobs before going to the farm at Forcett. The witness said: "We read to them a circular on the danger if not handled properly of the material they would use, and a copy was given to them. The circular warned that if excessive perspiration, thirst, fatigue and loss of weight were felt, work should stop and not be continued until a medical test was passed. It gave a warning to wear protective clothing. We have not taught that there is more risk in hot weather than in cool weather."

Rubber Clothing

The two men had had protective clothing issued to them—rubber boots, rubber apron, rubber gloves and eyeshield.

Dr. H. J. H. Payne, pathologist of the public health laboratories, Northallerton, said that a post mortem on the men revealed that the cause of death in both cases was dinitro-ortho-cresol poisoning.

The poison was accumulative and excreted slowly. It entered the system by ingestion, inhalation or through the skin and it was important that protective clothing was worn when the material was used. No drug had yet been found to counter the effects of the poison. He thought this kind of poison was more likely to occur in hot weather than in other temperatures. All the deaths which had resulted from the poisoning in this country had been in hot weather. Five people had died as a result of spraying operations and a sixth victim was engaged in industry.

The coroner commented that the tragedy appeared to have resulted through the men becoming careless in regard to protective clothing. More frequent inspections of employees engaged on spraying might be advisable and the question of temperature might require consideration.

Protective Industrial Gloves

No satisfactory definition for the purpose of exempting industrial gloves from purchase tax has yet been devised, according to a written answer by Mr. Douglas Jay, Financial Secretary to the Treasury. Representations that the tax on all sheepskin gloves should be reduced from 100 to $33\frac{1}{3}$ per cent were under consideration.

Chemical Exports Exceed £8.5m.

Marked Improvement in May Figures

THE official records of exports of chemicals, drugs, dyes and colours in May have disclosed a widespread improvement, contributing to a total of £8,508,108. That is £416,854 more than the same month of 1949, and £1,879,351 greater than April this year. Outstanding increases compared with May, 1949, were: lead acetate 11,481 cwt. (4336); tetra-ethyl lead 118,654 gal. (90,841); sodium sulphate 89,355 cwt. (46,698). Value of plastic materials was £728,880 compared with £427,989 in 1949 and big exports of copper and copper manufactures and unwrought tin, brought the value of non-ferrous metal exports to a new monthly record of £6,736,287.

	May, 1950	May, 1949
	Gal.	Gal.
Cresylic acid	253,649	60,627
	Lb.	Lb.
Salicylic acid and salicylates ...	125,545	173,534
Value of all other sorts of acid ...	£149,389	£145,083
	Tons	Tons
Sulphate of alumina	3,945	2,369
All other sorts of aluminium compounds	644	1,502
Ammonium sulphate	23,446	32,386
Ammonium nitrate	3,851	10,644
All other sorts of ammonium compounds	1,441	1,680
	Cwt.	Cwt.
Bleaching powder	43,299	33,022
All other bleaching materials ...	9,500	7,732
Collodion cotton	2,668	4,258
	Tons	Tons
Copper sulphate	5,137	4,643
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	37,643	42,235
	Cwt.	Cwt.
	Tons	Tons
Fertilisers	1,714	832
Value of gases (compressed, liquified or solidified)	£27,731	£20,653
	Cwt.	Cwt
Lead acetate, litharge, red lead, etc.	11,481	4,336
	Gal.	Gal.
Tetra-ethyl lead	118,654	90,841
	Tons	Tons
Magnesium compounds	936	873
	Cwt.	Cwt
Nickel salts	5,485	6,214
Potassium compounds	8,038	5,227
	Tons	Tons
Salt	20,393	23,479
	Cwt.	Cwt.
Sodium carbonate	258,893	299,649
Caustic soda	307,353	254,561
Sodium silicate	29,150	20,465
Sodium sulphate	89,355	46,698
All other sodium compounds ...	100,768	80,739
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	1,839,941	4,077,401
	Tons	Tons
Zinc oxide	532	950
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,594,578	£4,504,460
Value of quinine and quinine salts	£31,745	£32,726
	Lb.	Lb.
Acetyl-salicylic acid	210,057	116,877
	100 International Units	100 International Units
Insulin	1,722,903	951,170
	Mega Units	Mega Units
Penicillin	1,082,898	577,961
Total value of drugs, medicines and preparations	£1,786,619	£1,790,990
Total value of dyes and dyestuffs ...	£1,013,089	£757,876
Total value of paints, pigments, colours, etc.	£1,113,817	£1,038,423
Plastic materials:	Cwt.	Cwt.
Synthetic resins, solid and liquid, including adhesives ...	24,445	15,486
Moulding powders	20,591	8,691
Sheet, rod, tube, film and foil—		
Laminated	2,287	1,705
Non-laminated: cresylic ...	3,307	1,951
celluloid ...	874	1,169
other sorts	3,465	3,097
Total value	£723,880	£427,989
	Cwt.	Cwt.
Chemical glassware	2,031	1,488
Value	£63,703	£53,415
	Cwt.	Cwt.
Fans	4,345	3,369
Value	£117,501	£100,074
	Cwt.	Cwt.
Furnace plant	10,968	6,546
Value	£119,011	£75,718
	Cwt.	Cwt.
Gas and chemical machinery ...	22,338	16,817
Value	£325,238	£185,491
Scientific instruments: Optical		
Value	£67,888	£96,110
Thermometers, mercury in glass, etc.		
Value	£39,783	£38,568
	Cwt.	Cwt.
Air and gas compressors and exhausters	15,197	14,862
Value	£302,723	£292,846
Non-Ferrous Metals:	Cwt.	Cwt.
Aluminium and aluminium alloys	93,119	134,494
Value	£1,113,544	£1,397,059
	Lb.	Lb.
Bismuth metal (not including alloys)	50,899	32,014
Value	£36,971	£16,850
	Tons	Tons
Copper	8,171	7,493
Value	£1,528,053	£1,264,509
	Tons	Tons
Lead, unwrought	23,844	14,843
Value	£394,064	£174,167
	Tons	Tons
Tin, unwrought	1,897	108
Value	£1,131,875	£63,161
Total value non-ferrous metal group	£6,736,287	£5,365,602

Crude Black Molasses from Australia

The Board of Trade announces that it is prepared to consider applications for licences to import from Australia crude black molasses with a sweetening content not exceeding 60 per cent packed in containers of not more than 20 lb. net.

NEW I.C.I. RESEARCH CENTRE

Pharmaceutical Developments

TO obtain suitable facilities for their rapidly growing research and administration, Imperial Chemical (Pharmaceuticals), Ltd., has purchased 850 acres at Alderley Park, near Manchester. Building work on the site is expected to begin in 1951, the first laboratories may be occupied in about three years time. Many of the employees will be highly qualified scientists, to be recruited from all parts of the country. But the largest requirement will be young men and women as assistants to the scientific staff, and it is hoped to recruit these from neighbouring areas such as Macclesfield, Alderley Edge and Wilmslow. Those who prove capable will have opportunities for promotion from the assistants' to the scientists' grades.

Of the total area 150 acres consist of woodland and water, and will not be disturbed. Only a small proportion of 1200 acres of parkland will be allocated to buildings. The remainder will be used for grazing cattle required for the research programme. This programme can only be carried out in a clean atmosphere and under first-class agricultural conditions, and any industrialisation on or near the site would be detrimental.

The growth of Imperial Chemical (Pharmaceuticals), Ltd., since the war has been exceptional. Founded in 1942, the company is now considered to be the third largest producer of pharmaceuticals in the country and has acquired international distinction in the medical and veterinary fields.

Among its outstanding contributions to medicine have been Paludrine, the antimalarial, Sulphamezathine, a sulpha drug which combines powerful action with a high degree of tolerance by the patient, Kemithal sodium, a new intravenous anaesthetic, and Trilene, a safe and simple analgesic. I.C.I. was also one of the first companies in the world to produce penicillin on a commercial scale and, in the veterinary sphere, its recent production of Antrycide promises to give a large measure of control of trypanosomiasis.

Merz Patents Move

The new address of Merz Patents, Ltd., is 84 The Boulevard, Wylde Green, Sutton Coldfield. Tel. Erdington 5831. The Technical Office and Laboratory is at Westwood Road, Witton, Birmingham 6, and the London office is 10a Queensway, W.2.

ANALYTICAL CHEMISTRY

International Congress in 1952

IT has been decided that the meetings of the 1952 International Congress on Analytical Chemistry shall be held in Oxford, commencing on September 4. Accommodation will normally be provided in colleges, but some hotel accommodation will also be available. The technical sessions will take place in one of the main university buildings. The period of the congress will include a week-end during which excursions and visits will be made.

The arrangements for the congress are in the hands of a general committee under the chairmanship of the president of the Royal Society, Sir Robert Robinson. Its scope is under active consideration by an executive committee, under the chairmanship of the president of the Society of Public Analysts and Other Analytical Chemists, Mr. G. Taylor.

It is expected that a meeting of the board of section 5, Analytical Chemistry, of the International Union of Pure and Applied Chemistry, will be held in Oxford during the same week. Sir Ian Heilbron is honorary president and Professor C. J. van Nieuwenburg president of section 5. The honorary secretary is Mr. R. C. Chirnside, Research Laboratories, The General Electric Co., Ltd., Wembley.

£1 m. Phosphorus Project

A PLAN to construct a £1 m. factory for the production of phosphorus at Portishead, near Bristol, has been announced by Albright and Wilson, Ltd., Oldbury. Authority to manufacture at Portishead has been granted by the Board of Trade, and work on the factory, which will be the largest of its kind in the United Kingdom, will begin as soon as planning permission is received.

Test borings have already been made on a 20-acre dockside site and it is expected that the plant will be in full production by 1953, employing about 100 workers, including staff and scientists.

A power station capable of meeting its heavy demands adjoins the site of the new factory. All phosphate rock required at the new plant and the Oldbury works will be imported through Portishead.

The decision to build in Somerset instead of expanding the Midland factories was stated by Mr. W. B. Albright to be on economy grounds. Portishead would reduce road-haulage costs and labour problems were easier.

PARLIAMENTARY TOPICS

Reconsidering the Oil Tax

MEANS of granting tax relief in respect of white spirit and light hydrocarbon oils for industrial purposes were the subject of a question in the House of Commons last week. Sir Stafford Cripps, Chancellor of the Exchequer, in a written answer stated that if the trade interests concerned had any proposals to put forward he was prepared to consider them.

POLLUTION of the atmosphere, particularly in the area round Stoke-on-Trent, was the subject of questions by Dr. Barnett Stross. Mr. A. Bevan, Minister of Health stated that "the best possible means of prevention" were already applied and recent years had shown some improvement. Every effort would be made to see that this improvement was maintained. To a further query from Dr. Stross the Minister replied that wherever possible smokeless fuel appliances should be installed in reconditioned houses.

CONSTRUCTION of the new oil refinery at Fawley was ahead of schedule and there has been no delay due to shortage of labour, stated Mr. P. Noel-Baker, Minister of Fuel and Power, in a written answer.

QUESTIONED about the establishment of an oil refinery or storage plant by the Caltex Co. on the eastern side of Southampton Water, Mr. P. Noel-Baker, the Minister of Fuel and Power, confirmed in a written answer that a proposal for such a refinery had been approved in principle by the Government, but the precise locality was still under consideration.

"EXPERIENCE of some value" had been gained in producing combustible gas by igniting a coal seam underground at Newman Spinney, near Chesterfield, stated the Minister of Fuel and Power. Experiments would continue and a full-scale trial would be carried out in due course.

Charge on Fertiliser Stocks

A CHARGE on all stocks of fertilisers held by manufacturers and distributors acquired at the lower rates permitted by the earlier subsidy is to be made by the Board of Trade. This is the effect of the new Fertilisers Order, 1950 (No. 1039), which takes effect on July 1. This relates to all stocks of subsidised fertilisers and fertilisers made from subsidised materials "on which exceptional profit would accrue."

CLAY STUDY GROUP

Plans for International Exchanges

THE increasing use of clay as an important basic material in industry and new technological processes, particularly the U.S. production of aluminium, is thrown into relief by the formation of an International Committee for the study of clays. The object of the committee is to group together specialists in the various studies of clays, with representatives from each country to document the results and methods of clay studies.

Conferences between experts will be held from time to time, in which questions relevant to clay research will be discussed, thus enabling comparisons to be made and unification of description methods. Exchanges of reference samples and combined definition of terminology will be carried out.

Several national committees have already been formed in Belgium, France, Sweden and Great Britain. A Sub-committee was appointed in London during the recent Geological Congress, of S. Henin (France), chairman; M. Lepingle (Belgium) secretary; and R. E. Grim (U.S.A.) and D. M. C. MacEwan (Great Britain) as members. A further sub-committee has been formed to deal with the first questionnaire, on differential analysis, and the British representatives are Dr. D. M. C. MacEwan (Rothamsted Experimental Station) and Dr. G. W. Brindley (University of Leeds).

A meeting of the full committee is to be held in Amsterdam during the forthcoming International Congress of Soil Science (July 24-August 1, 1950).

Another Pyrethrum Substitute?

SCABRIN is the name of a new insecticide recently discovered by the U.S. Department of Agriculture, is an amide and is extracted from the roots of the genus *Heliopsis*, the common ox-eye daisy. Early experiments indicate that scabrin is appreciably more toxic to houseflies than is pyrethrum.

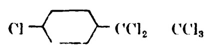
The effect of scabrin on animals and plants and on insects other than the housefly is unknown, and the technical aspects of its extraction from its weed source are not specified. The insecticidal element of pyrethrum is contained in the flowers and requires much hand labour for its recovery. A root crop might lend itself to mechanical tillage and harvesting. In this respect scabrin may be of considerable importance.

The Toxic Factor in DDT — II

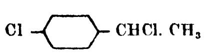
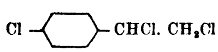
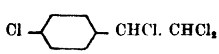
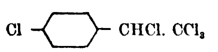
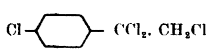
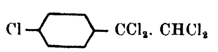
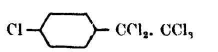
by R. W. MONCREIFF

Because of the uncertainty which still exists about the source of the insecticidal activity of DDT, all the evidence being accumulated is potentially of paramount importance. This further survey of current facts and assumptions indicates some suggestive new parallels.

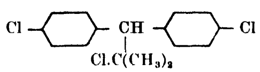
WOODCOCK prepared a number of chlorinated *p*-chloroethyl benzenes and tested their toxicity against the grain weevil *Calandra granaria*.[10] Most of the preparations were toxic to some degree, but none so toxic as DDT. It was found that toxicity increased with increasing chlorine content of the side-chain, although complete chlorination resulted in the product



which was virtually non-toxic and which could not lose hydrogen chloride. The relative toxicities of seven of these compounds was as follows:—

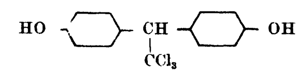
Compound	*Relative Toxicity*	*Capable of losing* HCl
	3	Yes
	5	,,
	33	,,
	47	,,
	14	,,
	100	,,
	4	No

It is difficult to marry these values with the idea that the insecticidal activity is due to loss of hydrogen chloride. Furthermore, in the most recent communication from Skerrett, Stringer and Woodcock, it is related that the substance

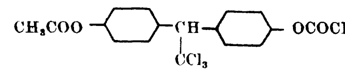


which can readily lose hydrogen chloride has little or no insecticidal activity. It seems to be evident that the view can no longer be maintained that the toxicity to insects of DDT is due to its ability to lose hydrogen chloride.

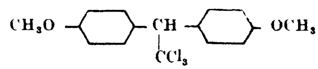
There is no doubt that an auxiliary factor in the toxicity of DDT is its lipoid solubility. Martin and Wain pointed out that the chlorphenyl groups of DDT would be expected to confer high lipoid solubility and thus high permeativity. The corresponding compounds, dihydroxydiphenyl-trichlorethane



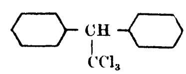
and its diacetyl derivative



are both more polar, and have correspondingly lower lipoid solubility than either DDT or dimethoxyphenyl-trichlorethane (Methoxychlor)



Furthermore, the compound diphenyl-trichlorethane



is relatively non-insecticidal, presumably because it is not sufficiently lipoid-soluble. So long as the *para* substituents in the phenyl group are those that will confer lipoid solubility, then the analogue of DDT will have insecticidal activity, but if they are strongly polar, e.g., hydroxyl or acetyl, there is no activity.

The product, in order to be effective, must be able to gain admittance to the insect tissues; it must have lipoid-solubility. There are thousands of substances that are lipoid-soluble and are not insecticides; the lipoid solubility is simply a necessary auxiliary property. In exactly the same way there are a multitude of substances that are soluble in water, yet relatively few of these are sweet; but no substance that is not water-soluble can excite the sensation of sweetness because it cannot make contact with the gustatory receptors. No DDT analogue can be an insecticide unless it is soluble in the lipoids of the insect's body.

Läuger *et al* had early suggested that the insecticidal activity of DDT was due to the presence in the molecule of two *p*-chlorphenyl groups as toxophores combined with the inhalation-anaesthetic effect of the $-CCl_3$ group, which also constitutes a large part of the molecules of chloroform and of chloral hydrate. Certainly, the high chlorine content of the DDT molecule attracts immediate attention—slightly over 50 per cent (by weight) of DDT is chlorine.

The Newer View

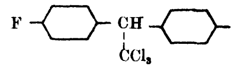
One is reminded of other insecticidal compounds that have high chlorine contents, notably Gammexane and such mothproofing agents as pentachlorphenol (Mystox B), the Eulans, Lanoc CN and Mitin FF, all of which are very rich in chlorine. Their constitution has been discussed elsewhere.[11] The toxophoric properties of the $-CCl_3$ group might be expected to lead to nerve paralysis, and when other efforts to find the toxic factor of DDT fail, most workers come back to the likely toxicity of the $-CCl_3$ group. Most recently, Skerrett, Stringer and Woodcock, having established beyond any reasonable doubt that neither molecular shape, nor ability to lose hydrogen chloride, is the essential property for the DDT analogue to exhibit insecticidal activity, have come back to the view that the insecticidal properties of DDT are bound up in some obscure way with some intrinsic property of the $-CCl_3$ group.

It should, however, be possible to take the matter a little further than this, and it will be helpful to consider what light the adaptation of insects to DDT and its analogues can throw on the subject. It seems now to have been established that some flies (house flies) are more resistant to DDT than the majority. When DDT is used repeatedly, only the resistant flies survive, and as they breed they develop a resistant strain. Keiding and van Deurs[12] have reported that DDT has been widely used since 1944 for fly control in Denmark. In some cases resistance was noticed the year after the first DDT treatment, but, in general, resistant flies were not observed until after two or three years of successful control with DDT.

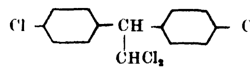
Evidently, the continuous selective extermination of non-resistant flies has resulted in the development of whole populations of the resistant type. House flies were collected in 1948 from six places from which reports had been received that they "could not be killed with DDT," even with much higher doses than usually recommended. Strains bred from these flies showed very great resistance when tested against a normal strain, as the following figures show:—

Insecticide dose	*Strain*	*Per cent flies knocked down after hours* ½	3	6	24	48
DDT 5 per cent oil solution 2 gram DDT per sq. metre of surface sprayed	Normal	94	100			
	Resistant No. 1					11
	No. 2					72
	No. 3					36

In some cases, flies "white all over" with 33 per cent DDT dust lived for several days, so successfully had resistance been bred into them. The flies that were resistant to DDT were also found, on test, to be resistant to Methoxychlor, as well as to Gix, the fluorine analogue of DDT (described by Domenjoz[13]),



and to dichlordiphenyl dichlorethane

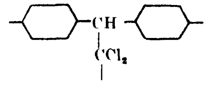


all of which are ordinarily highly toxic to flies.

They were, however, not resistant to insecticides of other types, e.g. benzene hexachloride, Chlordane, 1,2,4,5,6,7,8,8-octachloro - 4,7 - methano - 3a,4,7,7a tetrahydroindane, and Toxaphene, a chlorinated camphene. It has been found, in fact, that benzene hexachloride can be used to control DDT-resistant flies.

A Common Factor

These results throw some light on the problem of wherein lies the efficacy of DDT and its analogues. Since DDT-resistant strains are also resistant to Methoxychlor, it seems that the group common to these two must be that which is toxic. If we add the evidence obtained from the non-toxicity of dichlordiphenyl dichlorethane to DDT-resistant strains, it seems that the group



which is the highest common factor, or a part of it, must be responsible for the toxicity. The previously held view that the $-CCl_3$ group is responsible for the toxicity is difficult to uphold.

At this stage, let us return to a fresh consideration of the nature of the toxic group. If we examine, in the light of the above consideration, the findings of Skerrett, Stringer and Woodcock, we find

(continued at foot of next page)

DISTRIBUTION MEASUREMENTS OF DDT

Shell Organisation's Field Trials Station

AN experimental station, with laboratories equipped for production and testing of new compounds potentially useful as insecticides and weed killers, has been developed from a formerly derelict farm.

This station, which Shell Chemicals, Ltd., has established at Woodstock Farm, Sittingbourne, Kent, was the subject of a visit by the Press on June 21.

Field testing includes fixing of the minimum amounts of spray substances required to adhere to leaf surfaces, and special apparatus has been designed to assist in this work. A satisfactory method of measuring areas of leaf surfaces had first to be devised, and measurements are now made with the Arealimeter, an instrument constructed at Woodstock.

A batch of leaves is placed on a glass table screen within a cabinet, with a powerful light that throws shadow images of the leaves on to a photo-electric cell below, so that the total area of the leaves may be read from a galvanometer scale.

If the amount of DDT deposited on leaves requires to be recorded the DDT is dissolved off with benzene, which is then removed by evaporation in a current of air. Sodium hydroxide is added to the DDT and the sodium chloride thus produced is estimated by the silver nitrate method, which gives a measure of the amount of DDT present.

Adding silver nitrate by potentiometric titration, the amount required to neutralise the test solution bearing a direct relationship to the DDT content

THE TOXIC FACTOR IN DDT

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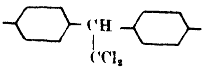
that of the six compounds that they made, only two possess the

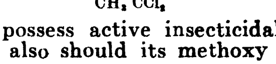


group and that these are the only two of the six which show any appreciable insecticidal activity.

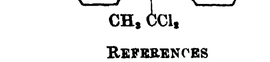
Too many compounds which do not embrace the $-CCl_3$ group in its entirety have been made and found to possess high insecticidal activity for the view to be supported that this group is essential to provide the necessary toxicity. There are, however, no compounds, analogues of DDT, of high insecticidal activity which do not contain the group $-CCl_2$. It is to this group, its toxic action augmented by the lipoid solubility due to the *p*-chlorphenyl groups, that we must look for the toxic factor of DDT.

Substitution of other non-polar groups for the two chlorine atoms in the *p*-chlorphenyl positions will not greatly affect the lipoid solubility and will not, so far as can be seen, affect the toxicity of the substance. It is for this reason that so many analogues of DDT are toxic.

If this view is correct, then the compound



should possess active insecticidal properties; so also should its methoxy analogue



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[10] Woodcock, *J Chem Soc*, 1949, 203-7

[11] R. W. Moncrieff, "Mothproofing," pp 59-84, London, 1950.

[12] J Keiding and H. van Deurs, *Nature*, 1949, *164*, 964-5

[13] Domenjoz, *Helv chim Acta*, 1946, *29*, 1317-22

A RAPID METHOD OF IMMERSION SILVERING

Pre-Treatment with Stannous Chloride

A NEW method of silvering has been discovered in the course of investigations undertaken by the Printing, Packaging and Allied Trades Research Association for the purpose of improving the process of electrotyping. This has been described by Mr. P. G. B. Upton (PATRA) and Dr. E. F. G. Herington (Chemical Research Laboratory, DSIR).

Members of PATRA suggested that the wax moulds used for electrotyping might be made electrically conductive by some cleaner and more efficient method than the usual application of graphite to the surface. The investigators considered that this might be achieved effectively by the application of a silver film to the surface. Experiments undertaken resulted in the development of a suitable process for this purpose. In the course of this experimental work the chemists became interested in the actual mechanism of the reduction of silver from the silvering solutions under investigation.

Most methods of producing silver mirrors by the chemical reduction of an aqueous silver solution suffer from the defect that only a small proportion of the reduced silver is deposited as a mirror on the required surface. The remainder is either deposited on the walls of the containing vessel or is precipitated in the solution and eventually forms a loose black sludge. Apart from the waste of silver involved, this sludge is objectionable, since it may spoil the mirror during its formation.

Efficient Precipitation

In general, methods of increasing efficiency (*i.e.*, the proportion of precipitated silver deposited as a mirror) depend *inter alia* on the reduction of the rate of reaction by the addition of various inhibitors.

While the mechanism of the silver process was being studied by PATRA, it was noted that a 1 per cent ammoniacal solution of silver, to which about 10-15 per cent of pyridine had been added, did not show any appreciable deposition of silver on the addition of sufficient hydrazine sulphate to reduce all the silver salt present, calculated on the reaction:

$$N_2H_4H_2SO_4 + 4AgNO_3 + 6NH_4OH = 4NH_4NO_3 + N_2 + 4Ag + (NH_4)_2SO_4 + 6H_2O.$$

It was found that, on a surface which had previously been treated with a solution of stannous chloride and washed with water, a heavy silver mirror was rapidly deposited. The following tables show the rate of deposition of silver, and the considerable thickness of the mirrors obtained from the solution with the pyridine addition, compared with values from the smoothed data of W. H. Banks for a normal type of process (using formaldehyde as the reducing agent) in which the surface was also prepared by treatment with stannous chloride.

70 ml 1% ammoniacal silver nitrate 10 ml pyridine, 16 ml 1 25% hydrazine sulphate

Time sec	Silver deposited gm/sq dm	Time sec	Silver deposited gm./sq. dm.
30	0 0064	420	0.0424
60	0 0095	660	0.0598
180	0 0216	3,600	0 164
300	0 0301		

Equal volumes 6% ammoniacal silver nitrate, 1% formaldehyde

Time sec	Silver deposited gm/sq dm	Time sec	Silver deposited gm/sq. dm
30	0 012	420	0.033
60	0 015	660	0 043
180	0 018		
300	0 028		

Despite the high rate of deposition maintained on the surface sensitised by treatment with stannous chloride, very little silver precipitation occurred in the bulk of the solution or on the walls of the containing vessel, and the solution remained perfectly clear and still usable some 24 hours after preparation, during which time a number of silverings had been made. The effect of the stannous chloride treatment in increasing the initial rate of mirror formation has been noted by previous investigators and has been shown quantitatively. It was believed at first that the effect of the pyridine addition was simply to reduce the silver ion concentration to a point where the reduction for any practical purposes would not proceed in the absence of a catalyst.

However, experiments with other amines, which would give even lower silver ion concentration from dissociation of the general $AgBO_2H$, failed to reproduce the differential inhibiting effect of pyridine. It was therefore concluded that either an impurity was present in the pyridine used (redistilled laboratory reagent grade) or that pyridine behaved uniquely in some way not understood. Tests were made with other

(continued on page 17)

IMPROVING FRACTIONATION EFFICIENCY

U.S. Experience with Rotating Columns

A NEW rotary concentric-tube distillation column for which very high efficiency in fractionation is claimed is one of the interesting results of recent studies in the U.S.A. of chemical treatment of the hydrocarbon oils. The research is the joint operation by the U.S. National Bureau of Standards and the American Petroleum Institute.

The experimental programme now being carried out at the bureau has two objectives: the investigation of the chemical constituents of the crude oil based upon the actual isolation of pure hydrocarbons and the securing of high-purity standard samples for the calibration of instruments used in analysing such complex mixtures as aviation fuels and synthetic rubber components. The new distilling column, which is expected to have wide application to fractional processes, is expected to aid materially in the bureau's hydrocarbon research.

Numerous devices, based on both theory and experiment, are available for producing high separating efficiencies in distilling columns. Among these are open tubes of small diameter, concentric tubes with a small annular space, and parallel plates with a small space between them. All, however, are limited in use by the relatively low quantity of material that may be volatilised per hour. According to theory, the efficiency may be improved by decreasing the spacing of the tubes or plates of the column, by decreasing the quantity of material for volatilisation, or by increasing the rate of diffusion of the gas molecule through the distilling column.

Improving Separating Efficiency

Decrease in the spacing (or diameter) has already been carried about as far as is practicable, while decreasing the quantity of material below the present low values is not feasible. Moreover, in a static apparatus, for a given temperature and composition, the rate of diffusion of the gaseous molecules is substantially constant. Accordingly, the new distilling column was designed to improve separating efficiency by increasing the diffusion rate of the molecules in the gas phase. This is accomplished by forcing the gas into turbulence through rotation of the inner closed cylinder in a concentric-tube rectifying section.

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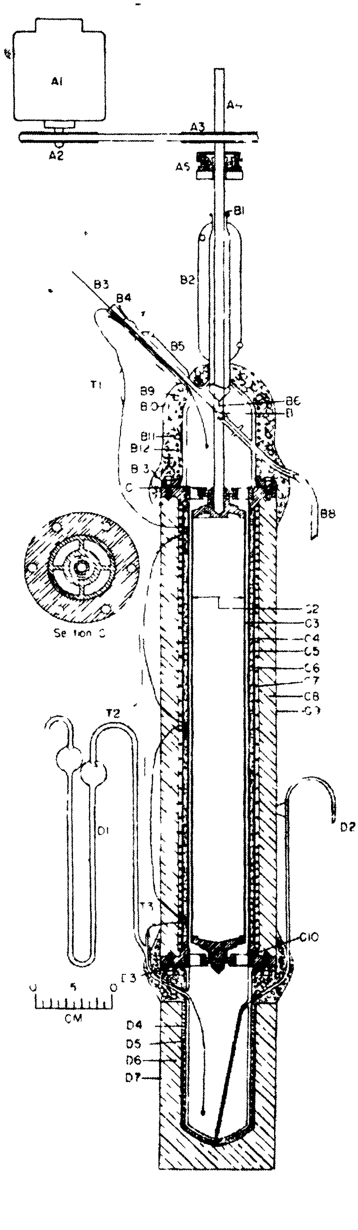

The apparatus consists of three parts—Pyrex head (B), steel rectifying section (C), and Pyrex pot (D). All sections are provided with external heating elements and copper-constantan thermocouples for temperature regulation. The steel rectifying section of this distilling column is the empty annular space, 0.043 in. (1.09 mm.) wide, formed by the inside surface of a stationary outer cylinder and the outside surface of a rotating closed inner cylinder, 2.928 in (7.44 cm.) in outside diameter and 23.0 in. (58.4 cm.) in length. A motor-and-pulley system drives the rotor at speeds up to 4000 r.p.m.

The outer cylinder is enclosed in an asbestos-covered metal heating jacket surrounded by three nichrome heating elements for the top, middle, and bottom portions of the jacket, respectively. The heating elements are covered externally with magnesia insulation and a layer of aluminium foil. The Pyrex glass head consists principally of a water-jacketed condenser directly above an opening into an electrically heated chamber, in which the liquid reflux may be collected and sampled by means of a glass valve. The heated chamber is surrounded by asbestos wool insulation and aluminium foil.

The pot, made of a 3-in. Pyrex pipe, is sealed at one end and provided with a butyl carbitol manometer and a tube for withdrawing samples. Heated externally by a Glasscol special sleeve-type heater, this also is surrounded by magnesia insulation covered with aluminium foil. Three thermo-elements are provided. One measures the difference between the temperature of the top portion of the rectifying section and the liquid-vapour equilibrium in the head. Another measures the difference between the temperature of the middle portion and the mean temperature of the top and bottom portions of the rectifying section. A third is used to determine the difference between the temperature of the bottom of the rectifying section and the temperature of the liquid in the pot.

Effect of Rotation

For high values of material to be volatilised—two to four litres of liquid per hour—this distillation column, when operated at 4000 r.p.m., has an efficiency factor about ten times those previously reported for other rectifying columns. The efficiency factor changes relatively little with intake of material at a given speed of rotation, but increases markedly with speed of rotation. This column also has low values of pressure drop per unit of material to be volatilised, which may be quite advantageous for distillations at low pressure.

Radioactivity of Solid Potash Fertiliser

POTASSIUM salts show a natural radioactivity which can be used for estimation of mixtures and compounds. The methods which have been described earlier have necessitated dissolving the sample and the radioactivity has been measured by using special Geiger-Muller counters for liquids. This was stated in a paper on "The Determination of Potash (in Fertiliser) by Measurement of its Radioactivity," by D. S. Lees, W. Broomfield and H. N. Wilson, presented at a recent meeting in London, of the Physical Methods group of the Society of Public Analysts and Other Analytical Chemists.

GM Technique

In the general absence of such specialised counters in this country, it had been possible to devise a reliable method of measuring the radiation of the solid itself. A 2-in. diameter Geiger-Muller counter was employed inside a lead castle fitted with fixed racks so that the distance between counter and sample was the same for all samples. It was essential that the area of the solid should be sufficiently large and the layer thicker than the critical depth.

The Geiger-Muller counter in its lead castle with preamplifier were connected to the scaling unit which counted the pulses generated. The maximum rate of handling was 2000 pulses per minute. The whole equipment was mains operated. Calibration was made with standard mixture of Analar potassium chloride, pure ammonium sulphate and pure ammonium phosphate.

The varying background count produced by strong radiation reduced the accuracy of the method, and it had been found necessary to take 40,000 counts to obtain a standard deviation of 0.5 per cent, which was equal to that of chemical methods. It was also necessary to watch for the presence of other radioactive elements, but in their absence the method had given satisfactory results on fertiliser samples containing 14.5 to 16 per cent of potassium oxide.

(continued from page 14)

materials known to occur in pyridine, but while comparable results were obtained with alpha and beta picoline, results did not show that the phenomenon was traceable to any particular constituent.

When the process was recommended, however, as a practical means of heavily silvering plastics in the manufacture of a special electrical component, it was found that the results obtained were markedly dependent on the source and quality of the pyridine used, and that no differential inhibition of silver reduction occurred when a sample of pyridine of purity greater than 99.9 mol. per cent, as established by the freezing point, was used. Examination by the Chemical Research Laboratory of a sample of pyridine found to give satisfactory results revealed the presence of a very small amount of a surface active agent. When a sufficient amount of a surface active agent was added to pure pyridine, differential inhibition of silver reduction was obtained.

It was also established that the variable behaviour of different pyridine samples was attributable to the varying proportion of surface active agent present. The desired results could be reproduced by adding a suitable proportion of *Fixanol C* (cetyl pyridinium bromide) to "inactive" pyridine, so that the process becomes completely controllable.

Stages of Inhibition

The addition of increasing proportions of surface active agent to a sample of pyridine giving no differential inhibition produces results in the following sequence: (1) No apparent inhibition of silver precipitation; (2) inhibition of precipitation in bulk of solution, but mirror deposition on walls of vessel as well as a sensitised stannous chloride treated surface; (3) inhibition of precipitation in solution, no deposition on walls of vessel but good deposition on sensitised surface; (4) as (3), but poor deposition on sensitised surface; (5) complete inhibition, *i.e.*, no deposition of silver at all. These effects change with the age of the solution and, in general, any inhibited solution will start to deposit silver after some hours.

These observations suggest that pyridine itself has no unique property in this process. Good differential inhibitions have been obtained by adding bases instead of pyridine—notably ammonia and *cyclo*hexylamine—in suitable concentration together with the appropriate addition of cetyl pyridinium bromide, using solutions of the order of 0.001 per cent.

The following is a recipe based on the use of pyridine: The surface to be silvered is pre-treated by being wetted with a solution of 10 gm. $SnCl_2$ in 20 ml. HCl (A.R.) and 80 ml. water. The surface is then rinsed with a 5 per cent silver nitrate solution, well washed with distilled water, and kept under water until required.

Two silvering solutions are prepared. Solution 1 consists of 10 ml. of *Fixanol C* solution (0.005 per cent), 16 ml. of 1.25 per cent hydrazine sulphate solution. Solution 2 comprises 70 cc. of 1 per cent solution of ammoniacal silver nitrate prepared by adding 0.880 per cent ammonia to 1 per cent silver nitrate solution until the precipitate just redissolves.

These two solutions are mixed just before use. The amount of *Fixanol C* solution is adjusted to give satisfactory results. No exact quantity can be recommended, since the amount required depends on the concentration of surface active agent already present in each batch of pyridine, and this may change with time.

Catalytic Effects

The process has proved useful as a tool to investigate the catalytic effect of silver, platinum and various other metals on the chemical reduction of metals from aqueous solution. The authors are of the opinion that the method should be of considerable use wherever the rapid and efficient deposition of a heavy silver film is required. The modern tendency in commercial silvering, however, is to use a spraying method in which the silvering solution and reducing agent are combined in a spray gun.

The new immersion process has already proved useful in the Telecommunications Research Laboratory, where it is used to apply a thick film of silver to the inside of tubes, enabling this operation to be employed with a degree of precision in applications where the spray method would not be practicable. It is considered that the process should be useful for instrument manufacture and for laboratory requirements, and further applications will no doubt be indicated as the principle becomes well known. The investigators have succeeded in establishing that the influence of a detergent in inhibiting the deposition of silver is quite remarkable, and this should enable silvering to be undertaken with a greater degree of control.

Pyridine is, unfortunately, rather toxic, but now that the principle has been established, it should be possible to use the detergent addition established in silvering processes to improve the efficiency of deposition, using a rather higher ammonia concentration than usual instead of the pyridine addition.

Metallurgical Section

1 July 1950

PROPOSED NEW HARDNESS SCALE

Russian Work on Instruments and Method

FURTHER information has now been published on the new micro-hardness tester PMT-2 designed by Prof. M. M. Krushchov, who introduced a year or two ago a new hardness scale and formula, as an improvement on the Mohs scale (*Zavodsk, labor.*, 9, 1947). Further developments and a more extended use of the PMT-2 instrument for the study of metals and minerals have now been proposed by S. D. Dmitriev, of the Leningrad Mining Institute, in *Zapisk, Vseoiuzn. Mineralog, Obshchestv.* (Memoirs of the All-Union Mineralog. Society), 1949, Pt. 78, 4, 241 252.

Various defects of the Mohs scale are indicated once more and the Martens sclerometer is also criticised. A. K. Boldyrev[1] had claimed long ago that with that instrument he had obtained a hardness for glass of 33, that is to say, higher than those of orthoclase or quartz. This may have been due to excessive wear of the diamond, for it is not always appreciated that even this material is liable to wear when used continuously in testing hard materials in the range of 7 and over in the Mohs scale (quartz, topaz, and corundum).

The PMT-2 Tester

Russian writers assert that hitherto there has been no really suitable instrument for accurately determining the hardness of these very hard materials. Dmitriev points out that, although the PMT-2 may not entirely fulfil all requirements, it nevertheless marks a substantial advance.

It is not very fully described. Essentially it consists of a microscope and a special form of indentor fitted with a square-based diamond pyramid. The stand on which the test-piece is placed can turn approximately 180° between the stops. It is claimed that alignment of the microscope axis with the test-piece is accurate to within 2-3 *mu;* and with the improved instrument in the Leningrad Mining Institute (PMT-2 No. 0-38) accuracy is within 0.5 *mu*.. Microhardness is determined by the formula:

$$H = 2 \sin \frac{a}{2} \frac{P}{d^2}$$

where a is angle between opposite facets of the diamond pyramid, namely 136°, P is the load in kg., d is the diagonal of impression in mm. Hardness number represents kg/mm^2.

Although a fairly considerable literature has grown up on the subject of both micro- and macro-hardness testing, relatively little relates to mineralogical study.[2] The first article of Prof. Krushchov was published in 1947[3] and was concerned with the choice of a basic method for determinining hardness of materials, and introducing a new scale for comparison with Mohs.

TABLE 1

Mineral	Mohs scale	New hardness numbers in kg/mm² M.M. Krushchov	S.D. Dmitriev
Talc ...	1	2 4	10–11
Gypsum	2	36	39–90
Calcite	3	109	145 165
Fluorite	4	189	175-260
Apatite	5	536	550–690
Orthoclase	6	795	780–850
Quartz	7	1,120	1,200–1,460
Topaz	8	1,427	1,800–2,000
Corundum	9	2,060	2,050 2,200
Diamond	10	10,060	-

Table 1 shows the Mohs scale compared with the independent numbers obtained by Krushchov and Dmitriev. It has to be noted that the Mohs' numbers are obtained with the natural facets of crystals and planes of cleavage without polishing, and that Krushchov gave definite values (averages) without the maximum and minimum limits given by Dmitriev. Such extremes are due to (1) varying hardness of the same minerals; (2) varying error

range of two instruments; and (8) subjective errors in measurement (not yet a single standard method). It is suggested that standard authoritative methods with standard materials should be introduced.

In 1948 appeared the work of N. Iu. Ikornikov[4] on the micro-hardness of a real crystal, with brucite as the example, in which it was shown that lack of homogeneity in hardness was an outstanding characteristic of crystals and was related to structural peculiarities. This had, in fact, been realised long before 1948. Another Russian writer published in the same year the results of his study of the hardness and strength of quartz of zonal and sectoral structure by the indentation method.[5]

Krushchov's Scale

A more important work was that of M. M. Krushchov on a new hardness scale published in 1949.[6] He showed that the first nine members of Mohs scale are arranged in a series ascending in proportion to the cubes of the scale numbers, and proposed that a further five classes be added, to make 15 in all. Hardness number (class) $H_o = 0.7H^3$, where H is hardness number in kg/mm^2 and H_o is Mohs scale number.

In 1948 the Crystallography Department of Leningrad Mining Institute began a programme of research on the micro-hardness of crystals with a view to adapting the new method to the study of minerals. It was based to some extent on Talmage's classification[7] in seven groups, A to G, and it was decided to verify whether this scale could be used in connection with diamond pyramid indentor micro-hardness tests. Other objectives were to determine hardness variation limits in the same mineral, the extent to which overlapping in hardness values of a group could be eliminated; and whether micro-hardness determinations could be made with mineral grains or crystals as small as 0.02 mm. in diameter.

The magnification used was ×600, drop period of indentor 15 sec., and exposure 5 sec. Efforts were made to determine extreme limits of hardness in the same mineral by using samples from widely different sources and by several tests on same sample in different zones, both natural and polished facets. Loads ranged from 5 to 200 g., and results recorded were averages of 5 to 10 micro-hardness tests. So far as possible, specimens were free from any defects. Using the Talmage series of minerals the following results were obtained (A). Table B presents a series in which overlapping has been eliminated:—

No.	A Name of mineral	Hardness in kg/mm^2	B Name of mineral	Hardness in kg/mm^2
1	Argentite	10–30	Argentite, bismuth	10–30
2	Galenite	70-105	Native Cu, galenite	65–115
3	Chalcopyrite	180–250	Bismuthine	120–165
4	Tetrahedrite	180–275	Chalcopyrite, sphalerite	170–250
5	Nickelin	390–520	Pyrrhotin	265–375
6	Magnetite	480–740	Ilmenite, magnetite	480–740
7	Ilmenite	505–690	Arsenopyrite	810–1,250

As a general rule in testing metal micro-hardness, the minimum size of grain or crystal should be such that the edges of impression made by indentor should be at least distant from the edges of test-piece by twice the diagonal length of the impression; and thickness of the test-piece should be more than ten times the depth of the impression made by the diamond pyramid of 136° angle, the ratio of depth/diagonal being 1:7.

With the new instrument PMT-2 other properties of minerals besides micro-hardness were also investigated, such as plasticity and tensile strength. Considerable attention was given to the forms of impression and these are illustrated and discussed, together with numerous pressure diagrams for ilmenite, bismuth, calcite, etc.

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Indian Aluminium Cables

An aluminium cable factory has been inaugurated at Kundara, near Quilon, India. This is turning out on an average about 10 to 11 miles of cable per day and the product is said to compare favourably with the imported product. There is a great demand for aluminium cables in India and it is the intention of the factory —the only one of its kind in India—to double its production capacity in the near future.

SOURCES OF BRITAIN'S PLATINUM

Rich Yields from South Africa's Deposits

THE South African output of platinum metals increased last year to 84,800 oz. compared with 68,926 oz. in 1948. By an expansion programme now approaching completion, output is expected to be raised very soon to an appreciably higher level. This aspect of the "productivity" theme is of considerable importance to British chemical, instrument and other industries because the entire output is exported to the United Kingdom.

The Union's known resources of platinum are immense. The Merensky Reef, discovered in 1924, has been located at intervals over a distance of about 100 miles in several districts of the Transvaal. This reef is a pseudo-stratified band of gabbroidal rock containing platinum sulphides. The band varies in width from a few feet to over 30 ft., the main platinum metals in the ores being platinum and palladium, though ruthenium, iridium and osmium are also found. Values vary from about 2 to 7 dwt., selected areas in the Rustenburg district assaying between 5 and 7 dwt. per ton over stretches measuring from 5000 to 18,000 ft. along the strike and several hundred feet on the dip.

Mining operations were started nearly 25 years ago under very favourable conditions, but the recovery of platinum metals from Canadian copper-nickel ores brought about a drastic change in the supply position. The price of platinum slumped, and, due to technical difficulties in the treatment of the ores with consequent high production prices, most South African producers were obliged to close down.

The Reduction Treatment

Since 1932 the Union's sole producer has been Rustenburg Platinum Mines, Ltd. This company has extracted the oxidised ore from its mine over a long stretch of strike and now draws its ore supplies from the sulphidic zone. The reduction treatment comprises gravity concentration followed by flotation. The flotation concentrates are smelted on the property in a blast furnace, a matte containing copper and nickel being produced. This matte is enriched by converting and shipped to London for refining and sale. With it come crude platenoids obtained by gravity conversion.

In view of the improved outlook resulting from the rapid increase in world demand, Rustenburg Platinum Mines decided after the war to double its plant, which was then capable of treating 20,000 tons of ore per month. Last year the rate of milling was progressively increased as portions of the new plant became available for use. By the end of the year it was in the vicinity of 50,000 tons a month. This rate could not be exceeded until the full supply of power was made available by the Electricity Supply Commission, which was expected to take place early this year.

Profitable Development

Last year the production of platinum was started in the same district by the Union Platinum Mining Co., Ltd. This company's ore reserves have been estimated at 4.8 million tons of ore, capable of permitting 32 years milling at the rate of 150,000 tons per annum. The available reserves are estimated at 250,000 tons of oxide ores and 89,000 tons of sulphide ores, averaging 6.3 dwt. of platinum metals per ton. So far development has shown 100 per cent payability.

Early last year, a plant capable of treating 150 tons daily was put into operation and plant to treat 500 tons daily is under erection. In September the operations of this company were reorganised with a view to treating sulphide ores only. Various changes were made in the reduction plant and it is expected that within the next few months production will reach the maximum permitted by the available power supply, approximately 10,000 tons per month. Augmented electrical power is expected to be available next year.

By an agreement ratified in December, Rustenburg Platinum Mines, Ltd., acquired the whole of the assets of the Union Platinum Mining Co., Ltd., and assumed its liabilities as from August 31, 1939.

The dismantling and rebuilding of the smelting furnace of Rustenburg Platinum Mines, Ltd., will be carried out shortly, and it is anticipated that there will then be sufficient capacity to smelt the concentrates from both the Rustenburg Platinum and Union Platinum sections.

Arrangements have been made with Johnson, Matthey & Co. to treat the combined output from both mines. The London company is extending its plant to deal with matte, and treatment of the South

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Mercury Production in Slovakia

An Important By-Product

From a SPECIAL CORRESPONDENT

THERE are three centres in Slovakia where mercury is produced. These are situated in the districts of Koterbachy, Mernik and Gelnica. Although the production of these centres amounts to only 2-3 per cent of world production, it is of importance as a by-product especially as the ore is amenable to direct distillation with the addition of lime to the retort to minimise corrosive action.

The extraction at Koterbachy goes back to 1837, when it was discovered that the silver-containing copper ores, the so-called "fahlerze," had a remarkable content of mercury. When, in 1895, the copper ores were exhausted, the mining and refining of iron ores which also contained mercury was established. Without either flotation or combined tabling and flotation, the ores are simply disintegrated and treated by direct furnacing, after being roasted in jacketed furnaces containing 1300 cwt. of material. The roasted gases pass to washing towers by means of ventilators, whereby mercury is condensed in the stubb (or stupp).

A more highly productive cinnabar deposit existed in Mernik, near Vranov, in Eastern Slovakia, where the ores were roasted in two large rotary furnaces connected to a well-constructed condensation plant. In 1942, however, when the Mernik ores were exhausted, the plant was removed to Gelnica. The ores of this district contain an average of 0.25 per cent mercury, or 5 lb. per ton of ore, compared with 14 lb. mercury ores being treated in Italy and 120 lb. ores in Spain.

The ores are brought from the sifting grate of a crushing and grinding plant over a rolling mill to the charging bunker of the rotary furnace which is 14 m. in length. The roast gases of this rotary kiln, heated with gas, are brought by ventilators into a concrete chamber (4.4 by 2.8 by 5 m.) before entering the condensation plant consisting of four cast iron tubes connected to eight up-and-down pipes cooled with water. Also connected are two concrete towers of 1 m. diameter into which water is sprayed. After lime addition, a press deals with the rich stubb thus collected, which is afterwards distilled in two iron retorts of 1.75 by 1.10 by 0.45 m. In 24 hours 300 kg. stubb can be worked up, the mercury vapour being treated in a condensation plant.

The mercury production of Slovakia owes its development to a large extent to Dipl.-Eng. Walter Wendt, who is also responsible for her important antimony industry. (THE CHEMICAL AGE, 62, 756.)

SOURCES OF BRITAIN'S PLATINUM

(continued from previous page)

African matte will be started as soon as possible.

The Merensky Reef has been the source of most of the South African output of platinum metals, but there is also an appreciable production of osmiridium, which occurs in minute quantities in the Witwatersrand conglomerates. This mineral is retained on the corduroy tables together with the gold. It is separated from the gold in amalgamation barrels and afterwards recovered by further concentration over shaking tables.

The composition of the osmiridium is variable, the content ranging from 26 to 43 per cent, closely followed by iridium and small quantities of platinum, ruthenium, rhodium and gold.

South Africa has long been the world's largest producer of osmiridium, an output of between 5000 and 7000 oz. per annum having been consistently maintained. Last year's production was approximately 6000 oz.

Government Steelworks to Close

TWO Government-owned steel factories are to be closed at the end of the year. They are the factory at Monk Bridge, near Leeds, and the works at Paisley, Lanark, both acquired to meet the needs of the Ministry of Supply during the war.

The official account states that, in view of the nature of the plants and type of production on which they were engaged, it was recognised that operation would be uneconomic. Losses incurred have been borne by public funds.

Both works have been kept in production until now under the management of firms which have acted as agents for the Ministry, but the expansion of steel output in the commercial factories is stated to have rendered their continued operation unnecessary.

THE ADVANCE OF TITANIUM

Increasing Use in Modern Metallurgical Processes

By A. E. WILLIAMS, Ph.D., F.C.S.

TITANIUM has long been used in industry in the form of titanium dioxide, a white pigment which has the advantage of being a most economical medium for paints, etc., because of its good covering power. In the field of metallurgy, titanium alloys have been increasingly applied during the past decade and are now firmly established as important agents for various purposes. In the steel industry, titanium is employed as a de-oxidiser, and is superior in this capacity to such metals as manganese, aluminium and silicon. Nitrogen gas is also eliminated by the use of titanium in steel, where the older deoxidising metals have no effect.

U.S. Titanium in 1949

The U.S. Bureau of Mines reports that widespread research in connection with the production of titanium metal and alloys was undertaken by the Government and private industry in 1949. The outstanding problem is to produce the metal at sufficiently low cost. In 1949, titanium metal was produced commercially for the second successive year. One pilot plant produced about 100 lb. per day, and another, of rather larger capacity, was put into operation near the close of the year.

Titanium has the property of modifying the grain size of steel, so that the properties of the latter are enhanced. When a ferro-titanium alloy is used in iron and steel a metal of maximum density is obtained, since internal cavities have been removed, and the resulting metal shows improved mechanical properties. The reason why titanium is superior to aluminium as a deoxidiser of ferrous metals is that titanium oxide, which is formed within the molten iron or steel, melts at a temperature of 1560° C., so that it rises to the surface with the molten slag, from which it can be removed.

On the other hand, aluminium oxide, Al_2O_3, has a melting point of about 2050° C., and remains in the iron or steel, the temperature of the latter not being sufficient to melt it. Much of the aluminium oxide therefore remains in the ferrous metals. In addition to removing oxygen and nitrogen, titanium has a high affinity for sulphur and combines with it, thus reducing the intergranular brittleness.

In a similar manner, titanium is capable of controlling the formation of carbide in steel, particularly the stainless varieties. Because of the well-known action of nickel in lowering the critical points of iron, and the sluggishness with which carbides form in high chromium steels, the 18-8 steels of this type apparently have a fully austenite structure at normal temperatures. When such metal is heated for a short time, however, some particles of carbide form in this austenite, and these carbides, which consist of 75 to 90 per cent chromium, rob the matrix in their immediate surroundings of so large a proportion of this element that the residue is unable to protect the metal from corrosion by certain chemial reagents.

Chromium Retained

This can be corrected by the use of titanium. If about six times as much titanium is present as there is carbon, the carbide formed from the metastable austenite is chiefly titanium carbide, instead of chromium carbide. In such conditions titanium forms a carbide more readily than either chromium or iron. The result is that the chromium content of the steel remains in solid solution with the iron and so can play its part in the resistant properties of the steel.

In the 5 per cent chromium steels the chromium content is not sufficient to make the steel a stainless variety, but it has good resistance to mild corrodants and to high temperatures. Such steel is used largely in the chemical process industries where high temperatures are involved, When forged and annealed, the microstructure of these steels is ferrite, with spherodised carbides, but the steel is intensely air-hardening, while castings are brittle and difficult to soften. Titanium now plays an important part in correcting these defects, for its carbides are so easily formed that the 5 per cent chromium steel, which is low in carbon and carries about ten times as much titanium, is soft and pearlitic in structure after cooling, while the chromium content forms very little carbide but remains free to fulfil its normal function.

Titanium is firmly established as a grain-refining agent in aluminium alloys, and nearly all such alloys used in aircraft and similar highly-stressed constructions contain a titanium addition. "Master" alloys are added, which contain varying proportions of titanium with other metals. The grain refining effect of titanium on aluminium alloys is regarded as being due to the dispersion of the compound $TiAl_3$ throughout the metal, causing a large number of centres of crystallisation, and acting partially as a catalyst. Titanium apparently acts chiefly on the macro structure of the aluminium alloys, rather than on the micro structure.

Shorter Heat Treatment

This type of grain refinement reduces the time necessary for heat treatment of alloys in the form of castings, forgings, sheet, etc. This is due to the greatly diminished crystal size, which permits rapid hardening results through micro-dispersion of grain boundary constituents. An aluminium alloy containing sufficient titanium to effect adequate grain refining can be worked with less edge cracking and other failures. Mechanical properties of the alloys are all enhanced.

A typical "master" alloy used for aluminium alloys contains from 1.5 to 3.5 per cent titanium, 7 to 47 per cent copper, with traces of iron, silicon, nickel and manganese, the balance being aluminium. "Master" alloys with much higher titanium contents are also used; a typical copper-free alloy being titanium 50 to 60 per cent, aluminum 35 to 40 per cent, with small amounts of iron and silicon. Other types of "master" alloy consist of titanium and copper as the main elements, while others are of the titanium-nickel type. The latter may contain from 26 to 65 per cent titanium, from 12 to 62 per cent nickel, and from 5 to 12 per cent aluminium, with small proportions of silicon and iron. For the addition of titanium to nickel and nickel-chromium alloys, these "master" alloys are practically essential; they are carbon-free and very low in other impurities.

Another application of metallic titanium is in the form of a "getter" for various types of vacuum apparatus. This is based on the affinity which titanium has for oxygen and affords an easy means of eliminating residual oxygen from vacuum vessels. A fine titanium powder is used for this purpose, immersed in a suitable volatile medium. For example, in an ordinary electric incandescent lamp, not gas-filled, residual oxygen (which the pumps cannot remove) is eliminated by painting the glass stem of the lamp with a mixture of ethyl alcohol and titanium powder. In heating and evacuating the lamps the ethyl alcohol is evaporated, leaving a thin film of metallic powder on the glass stem. This powder slowly oxidises during the life of the lamp and the residual oxygen is taken up, so prolonging the life of the tungsten filament.

Production

The most frequently used method of production of titanium metal appears to be the reduction of titanium tetrachloride with magnesium at a temperature between 800° and 900°C., in the presence of an inert gas such as argon or helium. The resulting product is titanium in powdered form and can be further purified, when necessary, by re-melting. Ductile titanium may be produced by induction melting in graphite.

The raw material for metal production, titanium tetrachloride, may be obtained by acting on the mineral rutile with coal and chlorine. The reaction vessel is charged with a layer of fused alkali chlorides, and liquid sodium is run on to the top of this layer. Titanium tetrachloride vapour is introduced into the flux layer and when the reaction is complete the vessel is cooled and the powder extracted. Iron is removed by immersing the powder in hydrochloric acid, followed by water washing. The powder is then dried, crushed and screened.

Precipitation Route

Titanium is precipitated quantitatively from chloride solutions by tannin when the acidity does not exceed 0.02N. In this weak acid solution titanium can be separated from such metals as V, Al and Fe, but not from Zr or Th, which latter are also quantitatively precipitated. This technique is often made use of in analytical work. Because of the difficulties in producing titanium in large quantities it is not as yet extensively used in its elemental state, but chiefly in the form of alloys. The pure metal is highly resistant to corrosion and has the strength of some types of steel, while it is much lighter in weight.

Titanium is produced from ilmenite and rutile. Ilmenite is an oxide of titanium and iron, while rutile is an impure form of titanium dioxide. Both are widely dispersed in many parts of the world in igneous rocks and black sands. During the past 30 years the production of ilmenite alone has increased from 5000 tons to over 600,000 tons per annum. Extensive deposits of sands rich in titanium exist in Australia, South Africa and Japan, and

many of them can be handled by electromagnetic separation methods.

The purification of ductile titanium may be carried out by heating the metal under a high vacuum at a temperature of 1000°C., which eliminates some of the occluded gases. Titanium powder may be compacted at a pressure of 50 tons per sq. in. and sintered in a high vacuum at a temperature approaching 1000° C. The compacted metal is ductile and can be made into sheet or bar by the normal techniques. Such material when annealed has a tensile strength of 82,000 lb. per sq. in., with 28 per cent elongation, and a hardness of 55, Rockwell A scale. After 50 per cent reduction, the titanium has a tensile strength of 126,000 lb. per sq. in., a 4 per cent elongation, and a Rockwell A 65.

The investigation of the capacity of ductile titanium for fabrication has shown the best technique to be the reduction of the sintered product by cold forging, and a decrease of 50 per cent in thickness may be made in this way, but the danger of overworking the metal is avoided by adopting a 25 per cent reduction. If the forged metal is annealed under vacuum at a temperature of 1000° C. for six hours, it may be reduced by cold rolling at a rate of 0.004 in. per pass. Much larger reductions per pass may be obtained by hot rolling at a temperature of 500° C., which is below the recrystallisation temperature of titanium, and at which no oxidation difficulties occur.

Fatal Laboratory Explosion

THE directors of Monsanto Chemicals, Ltd., announce with deep regret that Mr. Richard Biggs, foreman, and Mr. William Ward, process operator, lost their lives in an explosion at the company's Ruabon laboratories on June 26. The accident occurred in a pilot plant building used for small-scale operations.

Dr. E. M. Francis and Mr. A. Meadowcroft of the development division staff and Mr. C. Heyward, a fitter, were injured and are detained in hospital. Three other employees were allowed to return home. Fire, following the explosion, was quickly brought under control by the factory and local fire brigades and damage was confined to the one building concerned.

Ardeer Explosion Inquiry

A public inquiry at the Kilmarnock Sheriff Court on June 22 failed to disclose the cause of an explosion in the detonator department at the I.C.I. Ardeer factory, Stevenston, Ayrshire, on April 28, which resulted in the death of one man, and serious injury to another.

DUTCH CHEMICAL INDUSTRY

Capital and Technical Resources

THE average investment per worker in the Dutch chemical industry is sometimes as much as 100,000 guilders. Production in 1949 was valued at 1000 million guilders, 80 per cent of which was exported, stated Dr. P. Schoenmaker, director of the Central Institute for Development in Industry, at a recent meeting in Arnhem.

The outlook for Holland's chemical industry was not unfavourable. The country possessed some raw materials of great importance, such as salt, coal by-products and oil by-products, and its geographical position facilitated low-cost imports of other raw materials. The industry was still at the first stage of its development.

More Workers Needed

Dr. Schoenmaker pointed out that at least 75,000 more workers are needed in the Dutch steel industry and about 14,000 technical experts with an academic background are required by metal goods industries. The shortage of skilled personnel has not, however, prevented metal goods makers from achieving almost complete recovery from war damage. Their total production capacity is worth 2500 million guilders a year, while exports in 1949 reached 480 million guilders.

India Modifies Aluminium Duty

The Government of India has recently modified the duty on aluminium manufactures, including plate, sheet and strip aluminium and foil used in tea chest manufacture. The duty has been changed from 30 per cent *ad valorem* plus Rs.121 per ton to 30 per cent *ad valorem* and Rs.46 per ton. Duty on crude aluminium will henceforth carry a duty of Rs.287 instead of Rs.328, the *ad valorem* duty of 30 per cent remaining unaltered.

The Chemist's Bookshelf

A Manual of Organic Chemistry for Advanced Students. Volume One. G. Malcolm Dyson. 1950, London & New York. Longmans, Green & Co. Pp. 984. 63s.

This is the first of Dr. Dyson's three volumes to be published on the subject, and is an attempt to provide a comprehensive account of organic chemistry which will serve as a bridge between the usual text-books and the specialist monographs. Nominally, this volume is devoted only to the compounds of carbon, hydrogen, and the halogens, but there is more here than the title suggests.

In an extensive introduction the author deals with the various subject literature, including ten pages in German which help to explain the systems of reference and the collation of information. There follows the author's own special topic, a chapter on nomenclature that is at once lucid and lavish with examples.

The remainder of the book is based on a classification of compounds according to types. First come the hydrocarbons, and the fact that these merit 160 pages is an indication of the scope of the treatment; there follow chapters on alcohols, phenols and ethers as a group; aldehydes and ketones; ketenes and polyketides; acids and esters; terpenes and related compounds; polyalcohols, carbohydrates and derivatives; and steroids and biochemical substances. To each chapter there is an appendix which serves either to expand the chapter into greater detail where this is deemed necessary because of the importance of the subject concerned, or to indicate by summary interesting borderline topics which could not be fully dealt with in the text. All the many topics discussed by Dr. Dyson are interesting. They include epoxides, silicones, vitamins, hormones, plant and fish pigments, photosynthesis and a profusion of others equally vital to all concerned with the applications of the study of organic materials.

A close inspection will at once show that this is a truly impressive work. While not attempting to serve any particular syllabus, the author seems to have included everything immediately relevant and has dealt with his matter so that, with its two companion volumes to come, this work should be most useful to research graduates as a general handbook, while for less advanced students it may well provide a complete reference of the subject to beyond degree standard.

P.M.

Tube Works Gauges and Gauging Practice. Compiled by F. W. Clark. 1950, London. Stewarts and Lloyds, Ltd. Pp. 64. 5s.

This slim volume has been prepared for use in conjunction with practical work, by trainees at Stewarts and Lloyds, but should prove useful to engineering students in general. The subject is treated on an elementary plane, but thoroughly, though no mathematics are introduced.

The author explains the objects of gauging and the meaning of "tolerance" and "limit," and describes the fundamental measuring instruments. He then deals with the methods used for gauging and measuring plain tubes under various headings, and the more difficult subjects of eccentricity and ovality. Detailed information on the gauging of pipe screws and corresponding sockets is given, and there are notes on screw threads, American pipe threads, the optical projection machine and the care and handling of gauges. Two appendices give definitions of terms relating to screw threads and details of tolerance and limits. A list of reference books is included, and there are tables of British and American standards. The whole work is well indexed. Generally, the lay-out of the book seems good, with neat and fully explanatory drawings and four photographs which help to enhance the presentation.

P.M.

Engineers' Handbook

PROGRESS of engineering is reviewed and tribute is paid to the research associations which serve the industry in the 21st edition of the British Engineers' Association classified handbook of members and their manufactures (1950) just published. The volume has been distributed to 115 overseas countries including a special dispatch to Canada and the U.S.A.

OVERSEAS CHEMISTRY AND INDUSTRY

RECORD PRODUCTION IN CANADA

Nearly $595 m. for All Chemicals in 1949

PRODUCTION in the chemical and allied industries of Canada achieved a new peacetime record during 1949. Preliminary figures indicated that the output had a value of $594.8 million, which represents an increase of 2.6 per cent over the previous peak of $579.8 million in 1948. The total value of output in 1937 was $149 million. Except for soaps, cosmetics, adhesives and vegetable oils, both production and domestic consumption were greater than in any other year, states an article in *Foreign Trade*, the weekly organ of the Foreign Trade Service, and Canadian Department of Trade and Commerce.

Exports Decline

Exports were 11.4 per cent lower than in 1948, having declined for the third successive year to $70.7 million compared with $79.8 million in 1948 and with $83.8 million in 1947. They were valued at $16,372,000 in 1935, the last pre-war year for which the export figures are available. Fertilisers, exports of which were valued at $39.4 million, accounted for 56 per cent of the total. Synthetic resins, valued at $4.9 million, sodium compounds at $4.2 million, medicinals, including penicillin and streptomycin, at $3.8 million, acids at $2.7 million, calcium compounds, at $1.9 million and pigments and colours at $1.2 million, were next in order of importance.

Imports of chemicals and allied products, on the other hand, increased by 10 per cent last year to a value of $130.6 million, the gains being mainly in drugs and pharmaceuticals, cellulose plastics, fertilisers and miscellaneous chemicals. Purchases from the U.S.A. valued at $115 million, represented 88 per cent of the total, while imports from the U.K., valued at $8.4 million, were 6.5 per cent of the total. Other countries from which chemical products were obtained were: France, $1.8 million; Switzerland, $1.1 million and Germany, $1 million. Ten years ago the value of imports into Canada from all countries was only $51.8 million, and in 1930 the figure was $36.8 million.

Ten of the fourteen industries in the chemical group showed substantial gains in output last year, compared with 1948. The percentage increases were these: Coal tar distillation, 17.7; polishes, 15.1; primary plastics, 14.4; medicinals, 11.1; miscellaneous, 8.1; compressed gases, 4.7; fertilisers, 5.9; inks, 5.9; heavy chemicals, 2.6; and paints, 1.7. The production of soaps declined 4.9 per cent; adhesives, 20.1 per cent; vegetable oils, 12.4 per cent; and toilet preparations, 1.6 per cent. It is estimated that as much as one-half of the total gain in production value of Canada's chemical and allied products in the last decade was due to increases in commodity prices.

Employment in the chemical industries has increased from 27,682 in 1940 to 40,506 in 1949, while payments in salaries and wages have advanced from $38.6 million to $95.8 million. Firms manufacturing medicinals employed the largest number of personnel, the total in 1949 amounting to 8099. Others include: heavy chemicals, 6036; paints, 5501; and soaps, 3659 workers.

British Pipes for Canadian Oil

THE Anglo-American Oil Co., Ltd., in London, acting for Imperial Oil, Ltd., has placed orders for British steel pipes valued at more than £400,000. These, for some 80 miles of 10¾-in. steel pipe, 55,000 feet of 8⅝-in. seamless pipe and 300,000 feet of 7-in. casing, have been placed with Stewarts & Lloyds, Ltd., of Glasgow. The first consignments of pipe-line have already reached Montreal and further cargoes will arrive at intervals of two weeks, until approximately 5940 gross tons have been shipped.

The pipe will be used to link the prairie city of Winnipeg, Manitoba, with the main oil pipe line, now being built by the Inter-Provincial Pipe Line Company between the great new oil fields of Alberta and the Great Lakes. The scope of this oil project is indicated by the fact that the cost of the pipe line will be in the region of £1 million, and the initial throughput to Winnipeg will approach 500,000 gal. of oil.

Indian Red Ochre

An important deposit of red ochre is reported by the Geological Survey of India to have been located near Rajpur in Saurashtra State.

SOUTH AFRICA'S CHEMICALS

A Wide Range of Production Developments

From Our CAPE TOWN CORRESPONDENT

AN agreement to produce locally metallic naphthenate driers for the paint industry and other items has been entered into by Poly-Resin, Ltd., East London, and Nuodex Products Co., Inc., of America. The South African company has been in operation about two years, operating on a 16-acre site. It began with the production of hard resins such as ester gums and resinates, modified phenolics, cresylics and maleics. Production of condensation resins of the urea, phenol and cresol-formaldehyde types followed. Later additions were a Dowtherm controlled stainless steel reactor for the manufacture of alkyd resins, and a high-speed emulsifying unit. Now plant is being added to produce special formulations involving the polymerisation of oils to meet the needs of the paint trade and printing ink manufacturers. There will be additional reactors for resin production. The South African company is now affiliated with the Reichhold Chemicals organisation in the U.S.A.

* * *

PREPARATIONS for treating metal surfaces with a phosphate coating as a paint base for increased rust protection are now made under licence from the American patentees by a new Johannesburg firm in its Port Elizabeth factory. A full range of bottle washing alkalis and detergents, as well as general industrial cleaners, is also being produced by this company at its Durban factory under licence of a U.K. company. Other products made under licence include chemical preparations for metal-colouring processes and for the laundry and dry-cleaning industries, emulsion type degreasers, hand cleaners in powder form and boiler-feed water treatments.

* * *

ALTHOUGH the area under wattle in Natal and the Eastern Transvaal now probably exceeds 500,000 acres, the industry is faced with a demand far beyond its immediate capacity to supply, said the Director of the Wattle Research Institute in his report for 1949. There is a world shortage of vegetable tanning materials and lately attention has turned increasingly to wattle as one source that could be expanded rapidly.

A SCHEME to form a local company and open a factory in the Johannesburg area to make a wide range of abrasive products for the local market has been agreed by the Norton Company, of Worcester, Mass, U.S.A., in association with Anglo-American Corporation and other South African interests. The factory is to be built on a six-acre site at Isando industrial township near Kempton Park and may be in production early next year. Most of the plant is to be imported from the parent company in America. Technicians from America will also train the 100 to 150 South African employees.

* * *

A NEW type of belt dressing, claimed to be better than similar imported products, is being made by The Savo Manufacturing Co. (Pty.), Ltd., Johannesburg. This dressing is being sold as likely to save strain on bearings, as not liable to "build-up" on pulleys, and to minimise stoppages. The company is also making a new liquid, for the removal of rust from ferrous surfaces and to delay its formation, known in South Africa as Rustex. Articles can be brush treated or dipped, with or without heat.

* * *

AN increase of 50 per cent in the production of bi-chromates and chrome derivatives, all for export, is planned at the Merebank factory of Marble Lime and Associated Industries, Ltd. The enlarged plant should be in operation by the end of this year. A further 50 per cent increase in the output is expected at a later period. The initial extensions may cost about £100,000 and the complete programme some £200,000. Additional plant to be installed will include a rotary kiln and auxiliary plant for grinding, separating, mixing, residue handling and leaching. The chrome salts, such as sodium bichromate, chrome tanning salts, chromic acid, etc., will be exported to neighbouring African territories, to Europe, the Mediterranean countries, the Far East and South America, where it is believed good markets can be developed. Research by the company has resulted in the production of sodium sulphide for use as a depilatory by the tanning industry.

Technical Publications

SOLVENTS resulting from the Catarole cracking process which are suitable for oils, fats and waxes and most types of synthetic resins are described in a leaflet, No. 8A, issued by Petrochemicals, Ltd. Catarex solvents 15-9 are close boiling and water white. They do not tend to leave a "tail" on evaporation under normal conditions. They are stated to have a characteristic pleasant odour, to be free from corrosive sulphur compounds and contain less than 0.05 per cent total sulphur. Flash point of over 100°F. puts them in the relatively safe class of hydrocarbon solvents.

* * *

THE excellent mechanical properties of nickel-aluminium bronze alloys and their resistance to corrosion and erosion have led to their increasing application in industry and engineering. A new publication dealing with the composition and properties, machining, welding, brazing, soldering and founding of these alloys is now available from the Mond Nickel Co., Ltd.

* * *

A PORTABLE unit which will convert ordinary tap water to deionised water at the rate of about five gallons an hour has now been devised by the Crystal Research Laboratories, Inc., Hartford, Connecticut. Known as the Deeminizer, the unit is described in an article in the "Rohm and Haas Reporter" (Vol. 8, No. 1).

* * *

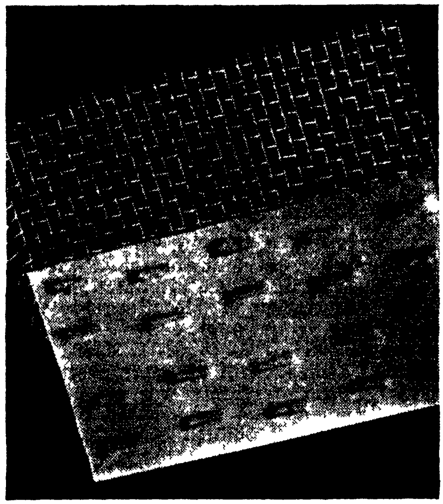
THE historical and statistical background of plastics, their raw materials, applications, and the research and development of an expanding industry were the subject of a special supplement published this week by the *Financial Times*.

* * *

PROGRESS in packaging technique and the marked development of automatic and mechanised processes in producing metal containers to unvarying high standards of accuracy are described in a new brochure now available from F. Francis & Sons, Ltd., London. The brochure commemorates the jubilee of the incorporation in 1900, although the firm's career goes back 30 years before that.

* * *

THE case for a separate boiler for each bottle washing machine is made in a brochure issued by the Potterton Gas Division of Thomas De La Rue & Co., Ltd. Working details of gas-fired boilers in conjunction with detergent injection are given.



[By courtesy of General Electric Co., Ltd., London

Two pieces of solid metal separated by wire gauze, as used in types of insect-proof screens. This is one of the many applications of cold pressure bonding to form joints difficult to achieve by any of the usual welding methods

APPLICATION of mercury drop control to derivative and differential polarography is described by L. Airey and A. A. Smales in the June issue of *The Analyst* (Vol. 75, No. 891), journal of the Society of Public Analysts and Other Analytical Chemists.

* * *

NOTES on the formation of nodular cast iron by the cerium and magnesium processes are a feature of "Foseco Foundry Practice," the hundredth issue of which is just issued by Foundry Services, Ltd.

* * *

EQUIPMENT for industrial battery charging is the subject of a new catalogue (ref. V.1014) now available from the General Electric Co., Ltd., London. A good description is given of the functions and advantages of selenium rectifiers.

* * *

A NEW monthly journal, *Indian Doctor*, makes its first appearance in India this month. Published in English it will contain articles on health and various branches of medical knowledge. The editor is Dr. Man Singh, principal, Old Indian Medical College.

OVERSEAS

German Chemicals for the Argentine

Under a trade pact to be signed shortly between the Argentine and Western Germany, the principal exports from the latter will include chemicals and drugs valued at $12,000 to be exchanged for grains, meat and meat products. Although classed as a government pact, the major part of its operation will be carried out through private channels.

Italian Metallurgy Award

A foundation to commemorate Professor Luigi Losana has been promoted by the Italian Association of Metallurgists, who are holding a national convention from September 28 to October 1, 1950. An award of a medal will be made every two years to the research worker of any nationality who has contributed most to the knowledge of metals.

New Type of Chromed-Steel Rod

The Kenmore Metals Corporation, New Jersey, has announced a new type of chromed-steel rod suitable for bending or welding without damage to the chromed surface. The rod is produced by a two stage electro-plating process in which nickel is first intimately bonded to a steel rod. Chromium is then electro-plated over the nickel to provide a hard, high lustre and permanent finish.

Higher U.S. Tariffs

Tariffs on lead imported into the U.S.A. from Australia, Canada and Peru will be doubled from the end of the year. This is the result of the termination on December 31 of the trade agreement between Mexico and the United States, under which many other nations enjoy tariff benefits. About half the oil imported, including that from the Middle East, will also be affected.

Norway Reduces Coal Production

The Store Norske Spitsbergen Kullkompani has decided to stop working one of its two coal mines at Longyear, Spitsbergen, on account of the increasing difficulties in disposing of the coal to markets outside Norway. The bulletin of the Royal Norwegian Information Service in London, referring to this, mentions that the total production at Spitsbergen this year was estimated at about 350,000 tons. The reduction, probably by about 50,000 tons, was influenced by the fact that an increasing number of ships are being converted to oil burners.

Yugoslav Lead Development

Prospecting in the Zletovo lead mines in Macedonia has revealed new seams, some in the vicinity of the old workings, and the whole are said to promise ample supplies for the next 10 to 15 years. New shafts are being sunk and 2700 ft. of new tunnelling is being completed.

Belgian Oil Refining

In his report to the recent 2nd annual general meeting of Albatros S.A. Belge pour le Raffinage de Pétrole, the president, Maître Léon Ponet, stated that during 1949 the refinery processed a total of about 127,000 tons of crude oil, all from the Middle East, out of a total Belgian refinery throughput of 350,000 tons. This is at present the largest annual throughput of any single refinery in Belgium.

Norwegian Nitrate

Nitrate production by the Norsk Hydro Company in 1949 reached a record total of 100,000 tons. It is hoped that by 1952 output will be 175,000 tons yearly. A further sum of 500,000 crowns has been set aside for research by the Norwegian Nitrate Company, which has already devoted 1.7 million crowns to this purpose. The company is also to give 400,000 crowns towards establishment of a technical and scientific research institute.

New Source of ACTH

It was announced on June 15 that workers at F. W. Horner, Ltd., Montreal, have succeeded in extracting ACTH from cattle glands. Previously, ACTH had been produced only from hog glands in the U.S.A. and it was not thought practical to extract it from cattle pituitaries. Experimentally, ACTH has been used for relief of arthritis and other diseases. Because of the scarcity and high cost of ACTH, extraction from cattle glands may prove of great interest to medical circles.

ECA Aid for New Caledonia Nickel

ECA authorities in Paris have announced an agreement with the French Government whereby $965,000 worth of U.S. equipment is to be provided for the modernisation and development of nickel production in New Caledonia. The agreement provides for the delivery, for the U.S. stockpile, of nickel of an amount related to the dollar advances. It is intended to raise the New Caledonia nickel output from the pre-war rate of 6000 to 7000 tons to 10,000 to 12,000 tons per annum.

HOME

Scottish Ceramic Materials

The Scottish Council (Development and Industry) is to appoint a committee to investigate the status of the ceramic, pottery, brickmaking and building materials industries in Scotland. A grant is being sought from the Secretary of State for Scotland. The Council also propose to create a Minerals Research Centre to examine and develop the lower grade mineral resources of Scotland.

Coal Production

Output of deep-mined coal last week showed a net decrease of 80,000 tons from the previous week. The estimated loss on account of 65 pits taking their annual week's holiday was nearly 152,000 tons. Comparative figures are:—Last week: 4,276,600 tons (deep-mined 3,994,600 tons, opencast 282,000 tons; previous week: 4,358,700 (deep-mined 4,074,500 tons, opencast, 279,200 tons).

Industrial Radiology Meetings

The summer meeting of the industrial radiology group of the Institute of Physics will be held at the New Horticultural Hall, Victoria, London, July 25 to 28 inclusive. Admission to the lectures and group summer exhibition, and to the technical exhibition of the International Congress of Radiology, will be by ticket only, obtainable free from the Institute of Physics, 47 Belgrave Square, London, S.W.1.

Training Centre Becomes a Factory

The Ministry of Works has approved the use of a former Government training centre at Paulsgrove, Portsmouth, as a factory to be used by Johnson & Johnson, principally for the manufacture of surgical dressings. The fact that some 4000 are unemployed in Portsmouth influenced the decision to use the building for industry, rather than as a school. The new industry will employ approximately 325 men and women, and later 500.

Hydraulic-Pneumatic Starter Device

Bryce Fuel Injection, Ltd., Staines, Middlesex, have acquired the rights to manufacture and market here and in many countries overseas a new type of hydraulic engine starter, particularly suited to oil engines, which requires no outside source of energy. Hand-operated, it employs an ingenious combination of pneumatic and hydraulic principles.

Textile Technologists

Sixteen technical colleges and schools in England and Scotland have entered 801 students for this year's examinations for National Certificates in Textiles. This is the largest entry recorded since the scheme —organised by the Textile Institute in conjunction with the Ministry of Education—was inaugurated in 1935.

Electrical Power Convention

Among the exhibits of interest to the chemical and allied trades which were on view at the British Electrical Power Convention, held at Harrogate from June 19 to 23, was that of Henry Wiggin & Co., Ltd., one of the largest producers in Europe of wrought nickel products and nickel-chromium alloys. A feature of this stand was a scale model of the new Ruston & Hornsby gas turbine, claimed to be the first British gas turbine designed throughout as prime mover designed for long service. This employs one of the Nimonic series of alloys for the blades, which operate in conditions of high stress at high temperature.

Deterioration of Coal

Deterioration of the quality of coal supplies was referred to by Mr. J. D. Pealtie, deputy chief engineer (generation) of the British Electricity Authority, in an address to the British Electrical Power convention in Harrogate last week. Coal now being supplied and used in British electricity generating stations, he said, would have been regarded as unsaleable 30 years ago.

Uncleaned coal supplied had increased from 7 million tons in 1939 to more than 17 million in 1948. Ash content of all deliveries had risen from 11.4 per cent in 1939 to 15.4 per cent in 1947.

Faults in Welding

Typical faults which can occur during the use of arc welds of mild and low alloy structural steel are defined in a booklet just issued by the British Welding Research Association. There are 44 illustrations showing typical faults, and an outline is given of their cause and how they may be avoided and corrected. The booklet, entitled "Memorandum on Faults in Arc Welds and Mild and Low Alloy Steels" (2s. 6d.), is reprinted from "Welding Research" (Vol. 4, No. 1, February 1950).

PERSONAL

Trade and Official Appointments

SIR HENRY TIZARD, who is 65 and has been scientific adviser to the Minister of Defence since 1947, will in future carry out this responsibility on a part-time basis only, continuing as chairman of the Defence Research Policy Committee. SIR FREDERICK BRUNDRETT will take up the post as his deputy from today (July 1). Sir Frederick, who was appointed chief of the Royal Naval Scientific Service in 1947, was knighted in January. During the war he was largely responsible for the mobilisation of scientists and scientific workers in the Government service.

DR. G. A. JEFFREY, who supervises research in the X-ray section of the chemistry department, Leeds University, has been invited by Pittsburg University to form a similar section and to serve as visiting professor for ten months. Dr. Jeffrey, who is 35, has specialised in the investigation of molecular structure by X-rays. He will leave for the U.S.A. in December.

SIR EDWARD APPLETON was described as "one of the chief magicians of the twentieth century" at the Commemoration Day celebrations, last week, at Glasgow University, at which the honorary degree of LL.D. was conferred upon him and upon PROF. ROBERTUS TODD.

MR. C. E. J. SENDALL and MR. A. J. JONES have retired from the board of Evans Medical Supplies, Ltd., after 42 and 38 years' service respectively. Mr. Sendall joined the firm in 1908 and became production director of the new workshops at Speke in 1943. Mr. A. J. Jones, who has specialised in biochemistry, joined Evans in 1918 to undertake pharmaceutical process research, and nine years later took charge of the Fine Chemical Works, Runcorn.

MR. J. P. HUNT, managing director of the Hallamshire Steel & File Co., Ltd., has been appointed chairman of the National Association for Rolled and Re-Rolled Steel Products in succession to MR. H. C. WATERSTON, vice-chairman of Bairds & Scottish Steel, Ltd.

MR. L. J. E. HOOPER, chairman and joint managing director of Doulton & Co., Ltd., has resigned as joint managing director but retains his office as chairman. MR. E. BASIL GREEN has been appointed managing director of the company as from July 1.

MR. J. H. LORD, one of the Dunlop Rubber group's executive directors, has been elected vice-president of the Federation of British Rubber Manufacturers' Associations.

"RESISTANCE MOVEMENT"

Widening Support for Individualism

THE undiminished respect accorded to those who have unwaveringly maintained the rights and responsibilities of the individual against all the incursions of the State in its many guises received a strong testimony at a luncheon in London on June 22, which nearly 400 attended, commemorating the 25th anniversary of the Society of Individualists. The occasion celebrated the 75th birthday of the guest of honour, Sir Ernest Benn, a founder of the society who has untiringly championed the cause of the individual.

Dr. C. K. Allen, presiding in the absence, through illness, of Lord Lyle of Westbourne, disclosed that members had donated nearly £2000 to provide some commemorative gift to Sir Ernest, who had chosen that the money should be used in widening the society's work. The chairman observed that, for his energy, enterprise, burning zeal and keen-edged dialectic, their founder-member would be remembered as an outstanding personality in his generation.

The characteristic of courageous independence was commended in warm terms by Sir William Darling, who described the principal guest as the leader of a resistance movement in the fight for individual freedom and liberty.

Sir Ernest Benn, in response to a toast, recalled the inception of the society and the inspired support quickly accorded to it by outstanding individuals at that time, by Arthur Balfour, Edward Grey, Eric Geddes, Nigel Playfair, Roger Keyes, Walter Runciman, William Plender and others. They asked for no votes, he recalled. They declined to take part in multi-party folly. They set forth one simple purpose of making it clear that "the State can't do it", and that it was in fact the citizen who kept the State and not the State the citizen.

The decline in many standards in this country, particularly those of national prosperity and in individual integrity, had been more or less continuous since 1910, when the politicians thought they would take a hand in the business of economic progress.

The Stock and Chemical Markets

THE serious news from Korea caused a general reaction in stock markets, led by British Funds, which were marked back sharply following their recent advance. Falls on Monday in long-dated stocks ranged up to 35s. in 3½ per cent Conversion, while 3½ per cent War Loan fell 32s. 6d. at £93 and declines of 22s. 6d. were shown in 2½ per cent Treasury Bonds and 2½ per cent Consols. Later, conditions steadied and the lower prices attracted buyers.

Leading industrial shares were generally 1s. lower on balance, and there were falls of up to 5s. in gold mining shares earlier in the week. There was no heavy selling, although sections which have recently rallied well reacted sharply. The fall was largely due to precautionary marking down by jobbers.

Shares of chemical and allied companies have reflected the general trend, falling heavily on Monday but later showing a moderate recovery. Imperial Chemical at one time fell to 40s., a reduction of 1s., but firmed up to 40s. 3d. at the time of writing. Fisons, after their recent rise on the interim dividend and the directors' confirmation that a total dividend of 9 per cent is expected on the larger capital, rose to 26s. 6d., but later came back with the market trend to 25s. 6d. Monsanto eased to 49s., Associated Cement to 85s. 3d., while British Aluminium fell 1s. 3d. at 40s., British Oxygen at 97s. lost part of their recent rise, and Borax Consolidated eased to 55s. 6d. and Dunlop Rubber to 60s. 1½d. Turner & Newall at 82s. lost 1s. 7½d. earlier in the week and United Molasses came back to 43s. 4½d.

Glaxo Laboratories were at one time 1s. 3d. down at 47s. 6d., but later rallied to 48s. British Match reacted to 37s. and British Plaster Board were back to 15s. 4½d. following the financial results, although the latter were in accordance with general expectations. Despite the interim dividend, British Industrial Plastics eased to 5s. 10½d. Kleemann lost 7½d. at 8s., De La Rue receded to 23s. and British Xylonite were back to 77s. 6d. The 4s. units of the Distillers Co. eased to 18s. 4½d., although the market expects the forthcoming results to be received favourably.

Iron and steels kept relatively steady, declines on balance not generally exceeding more than 6d. Guest Keen, after their recent rise, were back at 45s. Stewarts & Lloyds were 6d. down at 45s. 6d., United Steel eased to 25s. 10½d. and Vickers to 29s. 1½d. Staveley were 4½d. easier at 81s. 4½d.

Boots Drug were 6d. down at 47s. 3d., Triplex Glass at 23s. 10½d. lost part of their recent advance, but United Glass Bottle were unchanged at 75s. Lever & Unilever at 41s. 1½d. lost part of the rise which followed the good impression created by the financial results.

Oils' reaction to the general trend was evidenced by Anglo-Iranian losing 3s. 9d. earlier in the week and Shell 2s. 6d. Burmah, however, came back 1s. 10½d. There was a heavy fall in Ultramar Oil to 13s. 6d. following publication of the results and the debentures were £20 down at £135.

Market Reports

A STEADY home trade continues in most sections of the industrial chemicals market and the volume of inquiry for shipment has been reasonably good. The Convention prices of red and white lead have been decreased owing to a reduction in the controlled price of pig lead—as was suggested last week. The new basis price for dry white lead is £120 per ton and for dry red lead £110 10s. per ton. Quotations elsewhere generally remain unchanged. Among the soda products, caustic soda and soda ash are in active request and there is a ready outlet for sodium sulphide and sodium bicarbonate. Other items in good call are hydrogen peroxide and formaldehyde. Conditions on the coal tar products market remain steady. Phenol is firmer on a good demand and there is a reported U.S.A. demand for benzol.

MANCHESTER.—Values of heavy chemical products on the Manchester market have been well held and the undertone generally is firm. Home-trade users of the soda compounds are taking good deliveries, and a steady demand is reported for most of the potash, ammonia and magnesia compounds. Most other industrial chemicals are finding a ready outlet on the home market. Shippers' inquiries during the week have been on a fair scale. In the tar products markets the benzols and other light distillates are in steady request, and there has been a moderate business in the pale and other grades of cresylic acid.

GLASGOW.—Business in general has been steady, but there is a definite tendency for smaller quantities to be ordered. There has been considerable activity in solvents for export.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BLACKPOOL STAINLESS PLATERS, LTD. (M., 1/7/50.) May 30, deb., to Mosley Street Nominees, Ltd., securing all moneys due or to become due to Williams Deacon's Bank, Ltd.; general charge.

DAVEY & MOORE, LTD., Brimsdown, glass bottle manufacturers. (M., 1/7/50.) May 26, £370 guarantee and charge to Provincial Building Society; charged on certain moneys. *Nil. Oct. 12, 1949.

MARINE PAINTS & COMPOSITIONS, LTD., Surbiton. (M., 1/7/50.) May 26, £10,000 charge, to C. T. C. Chandless, Selmeston; charged on land with factory and buildings thereon at Chessington. *Nil. Dec. 28, 1949.

REDDITCH ELECTRO PLATING CO., LTD. (M., 1/7/50.) May 30, deb., to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge. *£8103. Dec. 31, 1948.

TRIMITE, LTD., Greenford, paint manufacturers, etc. (M., 1/7/50.) June 1, charge, to Westminster Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 86 Burnham Avenue, Uxbridge. *Nil. July 15, 1949.

BATTERY MAKERS OF IRELAND, LTD., Dublin. (M., 1/7/50.) April 28, £50,000 debenture, to The Chloride Electrical Storage Co., Ltd.; charged on premises at Stannaway Drive, Crumlin, Dublin, held under certain leases, also general charge. *Nil. June 29, 1949.

Satisfactions

MANNAH, LTD., chemists, Skegness. (M.S., 1/7/50.) Satisfaction June 3, of mortgage registered January 14, 1946.

CHARLES MOORE & CO., LTD., salt manufacturers, Liverpool. (M.S., 1/7/50.) Satisfaction June 2, of amount outstanding July 1, 1908.

Receivership

EUCOS PRODUCTS, LTD., manufacturers of pharmaceutical, chemical and cosmetic preparations, etc., 11a Carlisle Road, Hendon, N.W.9. (R., 1/7/50.) Mr. William E. Carnelley, 14 George Street, Mansion House, E.C.2, was appointed receiver on June 6.

Increases of Capital

The following increases in registered capital have been announced:—METROPOLITAN CHEMICALS (LONDON), LTD., from £300 to £10,000; TIDEBROOK CHEMICAL PRODUCTS, LTD., from £5000 to £10,000; RADIOL CHEMICALS, LTD., from £100 to £2000; ELTIBAR DEVELOPMENTS, LTD., from £800 to £2000.

Company News

Yorkshire Dyeware and Chemical Co., Ltd.

Group profit of the Yorkshire Dyeware & Chemical Co., Ltd., after all charges, including tax, was £63,511 (£119,591). The final dividend of 1½ per cent (12½), making for the year 10 per cent (17½), is on the doubled capital of £500,000.

New Registrations

Pectosol Corporation, Ltd.

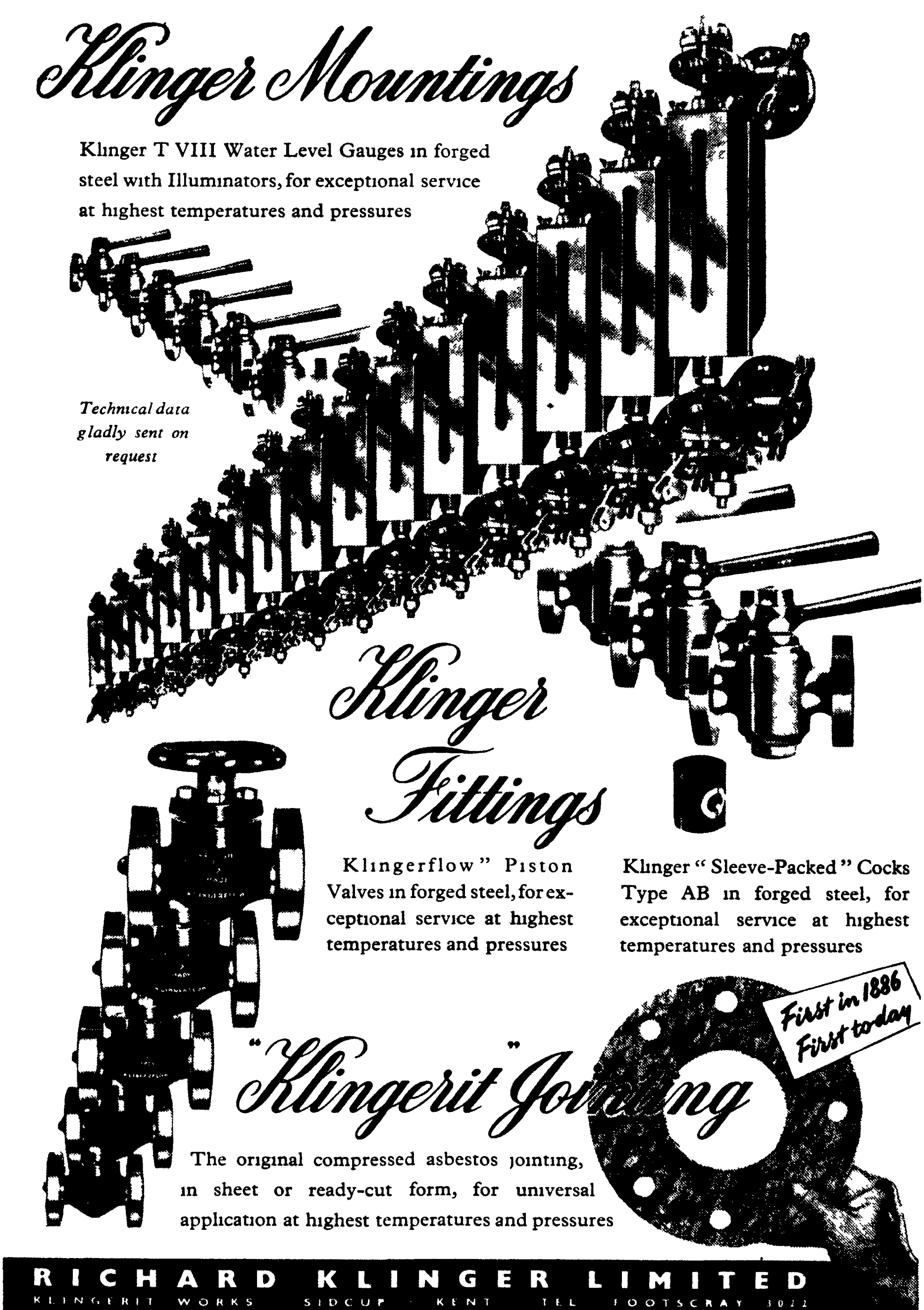
Private company. (483,503). Capital £20,000. Research workers, farmers, etc. Directors: Conrad L. Walsh, director of A.S.P. Chemical Co., Ltd. Lewin E. Parsons. Reg. office: 6 Bishopsgate, E.C.2.

Mirrlees Pingris Blairs Chemical Plant Co., Ltd.

Private company. Capital £5000. Selling agents of chemical plant. Solicitors: Maclay, Murray & Spens, 169 W. George Street, Glasgow.

Norton & Richard Laboratories, Ltd.

Private company. (483,484). Capital £500. Manufacturers of laboratory reagents, chemicals, gases, etc. Directors: Stephen Z. Norton and Michael L. Johnhouse. Reg. office: 81 Kings Road, Sloane Square, S.W.3.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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the production of unsaturated carbonylic compounds.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 5 1947. 640,383.

Copolymers of dipropenyl esters.—United States Rubber Co. Aug. 18 1947. 640,468.

Oxygen-producing plant.—F. T. Conder. March 9 1949. 640,389.

Process for the cementation of steel.—Gaz De France Ex-Soc. d'Eclairage Chauffage et Force Motrice. Oct. 6 1947. 640,289.

Activating the oxidising power of chlorite solutions and bleaching of cellulosic material therewith.—Solvay & Cie. Oct. 29 1947. 640,394.

Method of making non-metallic fuel tanks.—United States Rubber Co. Oct. 30 1947. 640,293.

Drying oil-dimer copolymers and process of preparing same.—Standard Oil Development Co. Nov. 7 1947. 640,474.

Peelable wax-containing coating compositions.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 12 1947. 640,476.

Production of wear-resistant iron-alloy surfaces.—Soc. d'Application des Traitements de Surface. Dec. 16 1947. 640,536.

Preparation of ketones.—United States Rubber Co. Dec. 19 1947. 640,479.

Production of hydroxy ketones from acetylenic alcohols.—Polymerisable Products. Dec. 22 1947. 640,477.

Complex salts of stabilised rosin amine. —Hercules Powder Co. Jan. 12 1948. 640,402.

Production of o-hydroxy-phenyl glycerol ether.—British Drug Houses, Ltd., W. Bradley, B. N. Feitelson, and R. M. Lodge. Jan. 7 1949. 640,403.

Process for the production of hydrocarbons and oxygenous derivatives thereof.—N.V. De Bataafsche Petroleum Maatschappij. Jan. 15 1948. 640,311.

Process for the manufacture of substituted phenols.—Beck, Koller & Co. (England), Ltd. Feb. 5 1948. 640,485.

Reclamation of metals or alloys from composite alloy materials or articles.—E. P. Harris, and F. J. Trostler. March 11 1949. 640,320.

Organic fluorine compounds.—E. I. Du Pont de Nemours & Co. Feb. 18 1948. 640,486.

Liquid phase polymerisation of styrene compounds.—Distillers Co., Ltd., and H. M. Hutchinson. March 3 1949. 640,413.

Manufacture of methylene-lactones.—E. R. H. Jones, and M. C. Whiting. March 7 1949. 640,489.

Methods of preparing aminoketones or their reduction products or salts thereof. N.V. Philips' Gloeilampenfabrieken. April 14, 1948. 640,492.

Plasticisation of polymeric hydrocarbons.—I.C.I., Ltd., F. W. Lord, T. J. Meyrick, and L. B. Morgan. May 2 1949. 640,494.

Production of gamma-ferric oxide hydrate and gamma-ferric oxide.—Columbian Carbon Co. June 14 1948. 640,438.

Purification of hydrogen chloride.—I.C.I., Ltd., and C. Carter. Aug. 18 1949. 640,444.

Methods of and means for growing crystals.—Brush Development Co. June 15 1944. 640,982.

Process for the manufacture of calcium aluminates.—J. C. Seailles. Aug. 29 1946. 640,905.

Method of producing normally gaseous fuels from carbon-containing materials.—C. Arnold (Standard Oil Development Co.). Sept. 10 1946. 640,907.

Process and apparatus for drying, cooling and deodorising soap.—G. Mazzoni. Sept. 17 1946. 640,908.

Purifying of organic dyestuffs.—Chadeloid Corporation. Feb. 13 1947. 640,915.

Methods of blackening stainless steel.—Alloy Research Corporation. May 13 1947. 641,091.

Surface active agents and process of making same.—Sun Chemical Corporation. May 21 1947. 640,924.

Chlorinated thiophenes and insecticides and fungicides containing them.—Pennsylvania Salt Manufacturing Co. June 18 1947. 641,094.

Process for the manufacture of acid dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 3 1947. 640,981.

Textile treatment compositions.—British Celanese, Ltd. July 10 1947. 640,989.

Process for affecting catalysed endothermic reactions.—Universal Oil Products Co. July 22 1947. 640,984.

Insecticidal compositions.—Harvel Corporation. July 30 1947. 640,991.

Treating hydrocarbon oils to reduce the sulphur content thereof.—Socony-Vacuum Oil Co, Inc. July 31 1947. 640,994.

Glass for forming glass-to-metal seals.—Marconi's Wireless Telegraph Co., Ltd. Aug. 13 1947. 640,948.

Methods of and means for growing crystals.—Brush Development Co. June 15 1944. 640,999.

Synthetic lubricant.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 29 1947. 640,945.

Evaporating or concentrating apparatus.—W. C. Mason and W. W. Hutcheson. Sept. 8 1947. 640,946.

Ammonia evaporation plant particularly for refrigerated transportation systems.—Standard Cap & Seal Corporation. Sept. 19 1947. 641,000.

Process for the refining of paraffin waxes.—Standard Oil Development Co. Oct. 6 1947. 640,949.

Method for the production of streptomycin involving the use of a fermentation medium containing yeast.—Merck & Co., Inc. Oct. 13 1947. 640,950.

Refrigerated transportation units.—Standard Cap & Seal Corporation. Oct. 16 1947. 641,004.

Absorption refrigerating apparatus of the inert gas type.—Electrolux, Ltd. Oct. 31 1947. 641,007.

Purification of penicillin.—E. Lilly & Co. Nov. 12 1947. 641,009.

Nylon fabrics.—Imperial Chemical Industries, Ltd. Dec. 3 1947. 640,960.

Production of pyrazoles. — General Aniline & Film Corporation. Dec. 5 1947. 641,015.

Installations for cathodically protecting underground metallic structures.—Aluminum Co. of America. Dec. 24 1947. 641,021.

Anode packages for use in cathodic systems for protecting underground metallic structures.—Aluminum Co. of America. Dec. 24 1947. 641,022.

Preparation of reduction products of N-phenyl-3, 5-diethyl-2-propyldihydropyridine.—B. F. Goodrich Co. Jan. 19 1948. 640,026.

Preparation of catalysts. — Anglo-Iranian Oil Co., Ltd., J. Owen, L. C. Strang and J. N. Haresnape. Jan. 27 1949. 640,965.

Electric battery cells using air as a depolariser.—Soc. le Carbone-Lorraine. Feb. 2 1948. 641,028.

Apparatus for testing temperature distribution.—F. H. Stark. Feb. 21 1949. 640,971.

Method for the preparation of peptone and amino-acid containing extracts from press water.—C. Drangsholt. March 16 1948. 641,120.

Catalytic improvement of hydrocarbon synthesis product.—Standard Oil Development Co. March 18 1948. 641,121.

Manufacture of thiourea.—Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De St.-Gobain, Chauny, & Cirey. April 1 1948. 640,976.

Recovery of chlorobenzene. — United States Rubber Co. May 14 641,041.

Evaporator calorimeters.—Odin Clorius Aktieselskabet. Aug. 16 1948. 641,058.

Heat-exchange apparatus. — H. N. Skerrett (Aktiebolaget Rosenblads Patenter). Aug. 26 1948. 641,153.

Porcelain glaze compositions.—British Thomson-Houston Co., Ltd. Sept. 21 1948. 640,872.

Manufacture of glass tubing.—H. G. Flood. Oct. 24 1949. 640,878.

Processes for forming lead dioxide plates for lead-acid cells.—W. F. K. Jones, R. Wynne-Lind and R. J. Doran. Sept. 27 1948. 641,159.

Anisotropic permanent magnet alloys.—W. Jessop & Sons, Ltd., D. A. Oliver, and D. Hadfield. Aug. 13 1949. 640,886.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMICAL ENGINEERS. Excellent prospects and permanency offered to experienced Chemical Engineers by The Bahrein Petroleum Company Limited, Persian Gulf. Applicants must possess a B.Sc. Degree or equivalent from a recognised Engineering School. Men, who in addition to their Chemical Engineering training, have had training in Mechanical Engineering and practical experience in designs problems applicable to the distillation and fractionation of hydrocarbons common to crude oil and coal-tar refining or chemical plants and other allied industrial processes, are preferred. Salaries according to qualifications and experience. plus kit allowance, provident fund, free board, air-conditioned living accommodation, medical attention and transportation costs. Agreements, 24 to 30 months, with paid leaves. Write, giving full particulars of qualifications, age, education, experience and salary required, to **Box 3427, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

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LIVERPOOL UNDERTAKING
APPOINTMENT OF THREE ASSISTANT CHEMISTS

APPLICATIONS are invited for the positions of Assistant Chemists on the staff of the Liverpool Undertaking.

Applicants should have had industrial experience, not necessarily in the Gas Industry, and preference will be given to those holding a Science Degree or Associate Membership of the Royal Institute of Chemistry.

The commencing salary will be within the range of £450 to £650, depending on qualifications and experience. The successful candidates may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt in future.

Applications, giving details of qualifications and experience of the candidate, and with the names of two referees, should be forwarded to the **Personnel Superintendent, Radiant House, Bold Street, Liverpool 1.** not later than 10 days after the appearance of this advertisement.

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PROJECTS ENGINEER, with Chemical Engineering background, and/or experience in the Oils and Fats Industry, required for interesting position. Only candidates capable of working conscientiously and on own initiative need apply to
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THE Civil Service Commissioners invite applications for 12 permanent appointments as **AREA GAS EXAMINER** (male) in the Ministry of Fuel and Power.

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Further particulars and application forms from the **Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 3145 TD. Completed application forms must be returned by 27th July, 1950.
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Volume LXIII | 8 July 1950 | Number 1617

Coal and the Chemist

THE annual reports of the National Coal Board, of which the fourth was issued last weekend,[1] are revealing, this year's disclosing, in particular, a solid measure of recovery from an apparently chronic state of small production and high costs. The report unfortunately leaves unsaid many of the things which specialists hoped to read.

Chemists and chemical manufacturers are interested in this last report mainly from three aspects. Like others in industry, they want clean coal at a reasonable price. Secondly, they are on the watch for an approach to the fuller chemical processes based on coal which they can introduce as soon as the present shortage conditions are banished. Finally, they want to know the extent to which scientific methods are being applied in the coal industry.

To the last of these questions the report gives as full and frank an answer as its space permits. A divisional scientific service analyses mine air and roadway dust (1,800,000 samples in 1949), prepares specifications for store, keeps an eye on effluent quality, besides carrying on its basic duty of systematic control of the quality of coal marketed. Chemists in this service also assist in technical control of coke ovens, by-product plants and brickworks. Physical and chemical studies of the coal in seams is carried out by the Coal Survey organisation which is also a part of the Board. Since 1948 an operational research group has been carrying on investigations; their activities are adequately reported but concern mainly mining engineering and organisation. The same year saw the formation of the Central Research Establishment at Stoke Orchard, near Cheltenham. Studies in this research station, however, form only a part of the Board-sponsored researches. Wisely, the NCB finances, and takes some part in directing, the work of some other associated research organisations. Among them is the Coal Tar Research Association, whose potential scope is discussed in this issue (pp. 51-54). Each of these organisations issues its own reports, but it would greatly improve any assessment of coal prospects as a whole if a little more space were allotted in the Coal Board's own report to indicate broad lines of work in both sponsored and unsponsored organisations.

Then, to return to the second aspect mentioned, the report in its familiar form gives no indication of chemical

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

and allied processes based on coal other than work on carbonisation, which in general will not interest manufacturers. The more intimate picture is again left to the Fuel Research Station, from which comes most material on coal hydrogenation and solvent extraction work. No mention of these is made in the report. It is true that the Scientific Member, Sir Charles Ellis, F.R.S., has recently lectured on contemporary research on coal,[2] but he confined himself to discussion of the fundamental structure of the coal substance. The time may now be ripe, however, to consider whether a separate publication might be justified in the light of the extent of extractive processes, outlining all research on and around Great Britain's premier mineral.

Not only processes but instruments developed may also be of general value. Rapid measurements of dust smaller than five microns in diameter are claimed to be possible with a new sampling and analysis instrument. The equipment for rapid determination of methane in mine air sounds as though it could be adopted for other industrial gases with high infra-red absorption. Samples for gas analysis are taken by small hand pump, stored in a metal cylinder (obviating the old glass breakage nuisance) and are then analysed instantaneously on an infra-red absorption apparatus. The methane content is read on a dial. Similarly, a new proportioning device for measuring out detergents in dust suppression work may well have use far beyond this first restricted field for which it was developed.

Tucked away in a section devoted to mining engineering is a reference to another matter of interest to chemists. In gassy pits, the methane—instead of remaining as a source of explosive danger—may be drained off. For the present it is used as a boiler fuel, being piped to colliery boilers. It is difficult to believe that this will remain as the sole field of use.

Coal utilisation is studied by the British Coal Utilisation Association, to which the Board is the largest subscriber. The general scope of its researches is outlined in a paragraph of the report. Most coal users would be interested to know, however, if a scientific investigation has been made to determine whether the continued large proportion of dirty coal was unavoidable or how it could be minimised. One of the most heartening things in the report, after the news that there has been a substantial profit

(*continued on page* 42)

Notes and Comments

Stainless Steel Prospects

REPEATED references to the fact that finding markets has in some quarters replaced the earlier problem of making available sufficient materials to supply them are obscuring the recognition that there are still grave material shortages, some of which still hamper full operation of the most remunerative kind. A passage in the recent review by the A.P.V. Company's chairman was a timely reminder. "It is a strange anomaly," said Mr. P. W. Seligman, "that while so much of our energy has been devoted to furthering this country's export trade we have to face the threat of competition in our home market from imported reproductions of some of our own specialities—made from raw materials exported from this country, of which we find it difficult to secure adequate supplies". It can be confidently assumed that the nigger in this particular woodpile is chromium steel, of which the polished sheet is one of the categories hardest to get. This shortage, which in the case of these process plant manufacturers was principally felt in 1949, is being relieved, but the elaborate productive plant is not to be conjured up at short notice. Plants are in fact now being erected, one for Firth-Vickers Stainless Steels, Ltd., may be ready by the middle of next year; but no substantial help for those who need these corrosion-resistant steels for export production seems to be at hand.

Progressive Alcohol Industry

THE great growth of the British solvents industry has rather unaccountably received much less attention than its remarkable technical and commercial aspects have merited. The magnitude of recent expansion and the virtual certainty that the process will be continued was made clear at Hull on Tuesday by British Industrial Solvents, Ltd., then celebrating the completion of 21 years' fruitful work in organic chemical industry. During the years since the war, expansion of plant capacity on this almost unlimited site by the River Humber or improvement of processes to secure economies or adapt them to changing needs for solvents, plasticisers and intermediates have virtually been continuous. The current evidences of this policy are large increases now being made to the acetic acid, acetic anhydride and the 2-ethyl hexyl alcohol sections.

Adaptability

SEVERAL reliable factors lend weight to the view that the manufacture of solvents, plasticisers and intermediates as carried on at Salt End, near Hull, will be more or less independent of the uncertainties to which most other chemical industries are subject. Demand, at home or by the new industries overseas, is assured whatever pattern the expanding plastics, lacquer and other user industries may assume. The flexibility of the great distillation and kindred units—practically all operating as continuous processes and requiring the minimum of supervision—would permit the bulk of the production to be changed over to other alcohol forms in a matter of hours. Finally, the possibility of adverse conditions in the procurement of raw material, an ever present possibility in several other branches of chemical industry, is absent here. The molasses route by which the parent Distillers Company produces the ethyl alcohol, the basis of much of the production at Salt End and the other B.I.S. plants, is not the only source. The Grangemouth installation of the related British Petroleum Chemicals will start next year to produce ethyl alcohol and isopropyl alcohol, both basic materials for the Hull industry.

Coal to Cortisone?

OF the discovery of new by-products of coal—complementary to the large number already known—there appears to be no end. Many of these

have, in the past, been the products of tar from the two high temperature carbonisation systems, and are well known. The low temperature carbonisation of coal, however, results in the production of liquids and solids of entirely different compositions, about which very much less is generally known. In this provocatively undefined sphere, new products are always liable to materialise. The latest of these may almost be termed "spectacular." It is referred to in the statement by Commander Colin Buist, chairman of Coalite and Chemical Products, Ltd., circulated in advance of the company's meeting, to be held in London on July 21. At the low temperatures at which the Coalite process operates, he says, little cracking takes place, and there is produced a series of somewhat unstable materials of which very little was known prior to 1933. Even more significant is his claim that there is still no textbook which will give guidance on the working up of these materials on a commercial scale. Commander Buist was probably not overstating the comparative neglect of this field in claiming that the only real knowledge of the by-products released from coal carbonised at low temperatures was locked within the archives of the Coalite Company. That obliged them to carry out their own research with very little outside help from consultants and laboratories. The latest of the company's new products was found, not as a result of careful research work—as was generally the case—but by pure chance. That was 2-methyl resorcinol, isolated last year, which in the Dyson Perrins Laboratory at Oxford, was now being used as the starting point for a projected total synthesis of cortisone, the new drug for the alleviation of rheumatoid arthritis. If this somewhat unconventional line of approach succeeded the price of the material for alleviating rheumatoid arthritis might well fall to an economic level. The present long and involved series of reactions, requiring some 35 stages, to make Cortisone from natural products such as bile acids or plant sapogenins renders the drug prohibitively costly.

COAL AND THE CHEMIST

(*continued from page 40*)

instead of a loss, is the assurance that the drive for cleaner coal will be continued and intensified.

Even if a large proportion of the cleaning plant taken over from the private colliery industry was in fact old and inefficient, the increased use of machinery at the coal face, producing more dirt than hand working, has contributed largely to the serious fall in coal quality. Thinner and dirtier seams are also mentioned among the causes. If there is any evidence other than the judgment of mining engineers to prove that dirty coal is an inevitable condition it should have been presented in this report instead of some vague generalisations.

There is no doubt that science is today being more actively applied in the coal industry than ever before. The arguments of those who supported coal nationalisation on this score alone are beginning to be substantiated. But as the board is a public body and the industry is everybody's business, much more should have been made known of the research which the board sponsors. To be complete, this annual review should take some account of the research on coal which the board does not sponsor.

REFERENCES

[1] National Coal Board Report and Accounts for 1949. London, H.M.S.O. 7s net

[2] "Recent Research in Coal," by Sir Charles Ellis, F.R.S., *Nature*, *165*, 583, April 15, 1950

Lead Price Again Reduced

The price of U.K. lead was reduced by £4 a ton from £92 to £88 on Thursday, June 29. This was the second reduction within a week, the previous cut being on June 24 to £92 from £96, the price which had been in force since May 12. Lead has now practically reverted to its pre-devaluation level of £87 5s.

DEFINING CHEMICAL INDUSTRIES

Rulings by Fourteen Countries at Geneva

IMPORTANT discussions affecting the chemical industry were held at the second session of the Chemical Industries Committee of the International Labour Organisation held in Geneva in April. Notes on the proceedings, which were divided under three main heads—general report, safety and hygiene in the chemical industries, and special aspects of working hours—have now been issued by the International Labour Office.

Of the 15 member states of the ILO of which the Chemical Industries Committee is composed, only China was not represented. Tripartite delegations were sent by the remaining 14 countries, namely, Belgium, Brazil, Canada, Denmark, France, India, Italy, Mexico, Netherlands, Norway, Sweden, Switzerland, the United Kingdom and United States. A delegation of observers from the German Federal Republic also attended.

Officers elected from the 78 delegates and 23 technical advisers were divided into three groups, representing Government, employers and workers.

Working Basis

The first problem was a discussion on the establishment of a permanent definition of the chemical industries. It was agreed to accept as a basis for its work the broad definition adopted by the committee at its first session which divided chemicals into three main groups: basic (or heavy), intermediary (industrial or semi-finished), and fine (or finished).

It was also understood that in every case in which it was not clear whether an industry or branch of industry was devoted entirely or mainly to the manufacture of chemical products, it would be for the competent national authority (after consultation with the employers' and workers' organisations), to decide whether that industry or branch of industry should in its country be classified in the category of chemical industries within the scope of the Chemical Industries Committee.

The United Kingdom Employers' member proposed that this freedom of choice should be reserved to the competent national authorities also in cases where labour relations in industries manufacturing chemical products were organised independently of those in the chemical industry, and he proposed the following modification: "It would be for the competent national authorities, in agreement with the employers' and workers' organisations concerned, to decide whether that industry or branch of industry shall in its country be classified in the category of chemical industries within the scope of the Chemical Industries Committee of the International Labour Organisation." This proposal was accepted by the Working Party without opposition.

New Nomenclature

The Working Party reaffirmed the view that it is the manufacture and not the use of chemical products which should serve as a basis for the definition of chemical industries. The Working Party, further, considered it desirable to establish, on the basis of the nomenclature of chemical products contained in the provisional definition, a new nomenclature as complete as possible.

It was, accordingly, decided to adopt as criteria: (a) the technological character of the operation; (b) the nature of the work and the system of wages used; (c) the commercial presentation of the final product; and to review in the light of these criteria: the products contained in the provisional list of chemical products adopted at the first session; the products whose inclusion in the list had been postponed at the first session; and certain additional products.

Debatable Items

Certain products gave rise to discussion and necessitated recourse to a vote for the purpose of deciding whether or not they should be retained in the new nomenclature.

Among these were the following: The inclusion of matches was opposed by some employers' members. Sweden and Denmark stated that only a very small proportion of workers in this industry were engaged in the chemical side of the production. The U.K. representative opposed it because the structure of industrial relations in this country was different in the case of the match industry from that of the chemical industry. Inclusion was decided on by a majority vote.

The item, industrial alcohol, was objected to as being unduly vague, but

after discussion was retained as originally worded.

Under the heading chemical products used for pharmaceutical purposes it was proposed by the British Government member, supported by the U.S. Workers' member to add: chemical products for veterinary purposes. This was unanimously adopted.

The discussion on the item radioactive products was concerned whether to add the words rare earths and their derivatives. On the proposal of the U.S. Government member it was agreed that the wording should be radioactive materials and products.

With regard to artificial and organic fibres after lengthy consideration it was decided that the manufacturing of synthetic organic fibres, but only up to and including their final preparation for weaving or knitting, is a chemical process.

Problem of Rubber

The item synthetic rubber also gave rise to discussion, on the question not of the inclusion of synthetic rubber, which was not contested, but on the inclusion of natural rubber. The United States Workers' member stated that synthetic rubber was being used more and more in his country, and that the processing of natural rubber was a chemical operation. The United States Government member proposed that this item be worded natural and synthetic rubber, excluding fabricated articles. This was agreed to.

Of the other products whose inclusion in the nomenclature had been postponed by the committee at its first session, the Netherlands Workers' member proposed to include the item glass industry, and he proposed the establishment of a subcommittee to deal with this industry. The proposal to include this item was not accepted, five members voting for this proposal and five against it.

The following resolution was adopted:—

That the following be considered as chemical industries within the scope of the Chemical Industries Committee of the International Labour Organisation, irrespective of existing classifications for strictly national purposes.

(a) Industries entirely or mainly devoted to the manufacture of the chemical products specified below.

(b) All branches of industry, to the extent that they are entirely or mainly devoted to the manufacture of chemical products as specified below, even in cases where the industries of which they are branches are not themselves entirely or mainly devoted to the manufacture of such products.

In every case in which it is not clear whether an industry or branch of industry is devoted entirely or mainly to the manufacture of chemical products, or where the labour relations in any of the industries manufacturing the chemical products specified below are organised independently from the chemical industry, it would be for the competent national authority, in agreement with the employers' and workers' organisations concerned, to decide whether that industry or branch of industry shall in its country be classified in the category of chemical industries within the scope of the Chemical Industries Committee of the International Labour Organisation.

For the purposes of the resolution, the expression chemical products denotes the following products:—

Acids, alkalis, oxides and salts.
Chlorine and its derivatives.
Sulphur, phosphorus, arsenic, antimony, iodine, bromine, fluorine and their compounds.
Chemical derivatives of aluminium.
Hydrogen peroxide, persalts and organic and inorganic peroxides.
Cyanides including derivatives.
Calcium carbide.
Nitrogenous compounds.
Artificial fertilisers, inorganic or organic.
Petroleum chemical products.
Chemical products or natural gas.
Products of the distillation of coal tar.
Products of the hydrogenation of coal, lignite or coal tar.
Explosives.
Matches.
Compressed, liquefied and dissolved gases.
Activated carbon and electro-chemical carbon, including artificial graphite.
Synthetic precious stones.
Soap, candles and glycerine, fatty acids and their derivatives.
Industrial alcohol.
Products of the distillation of wood
Products of the hydrolysis of wood and lignines.
Dyeing and tanning extracts.
Resins, turpentine and camphor.
Adhesives.
Glue and gelatine.
Synthetic organic chemical products.
Chemical products used for pharmaceutical and veterinary purposes.
Sensitised and chemical products used for photographic purposes.
Perfumes and other aromatic substances, including natural and synthetic essential oils.
Organic and inorganic dyestuffs.
Lacquers, varnishes, paints, colours, pigments and inks.
Chemical products for cleaning and polishing.
Radioactive materials and products.
Synthetic resins and plastics, excluding fabricated articles.
Bituminous emulsions.
Corundum, carborundum and similar abrasives.
Insecticides and fungicides, dips and disinfectants, weed-killers and plant hormones.
Ancillary products for textiles, synthetic detergents and emulsifying agents.
Natural and synthetic rubber, excluding fabricated articles.
Chemical products obtained by fermentation.
Blacks, acetylene black, anthracene black, lamp-black, animal black and bone black.
Silicon tetrachloride, precipitated silica, silicic ethers and silicones.
Starches and modified starch.

FUNGICIDES FOR PACKAGE PROTECTION

Effective Compounds Now in Use

MOULD spores are in the air as a component of dust and may be present in water, on utensils and on the human skin. In favourable conditions of temperature and humidity—the optimum conditions are generally rated as 68° F.-104° F. and relative humidity 80-95 per cent—spore growth begins, at rates dependent on the species, chemical condition of surroundings and the food supply.

Many well packaged goods suffer from mould growth when stored under tropical conditions and a good deal of thought has been given by manufacturers to various non-toxic fungicides which can be conveniently incorporated in the packaging medium to increase their resistance to attack.

Ordinary cellulosic materials, such as paper in all its various forms and fabrics are subject to attack and ultimate destruction by moulds. Some microcrystalline wax compositions used for impregnating paper provide a good medium for growth and even pure paraffin wax is not entirely suitable as a protective agent. Cellulose acetate is more resistant to attack by moulds than ordinary regenerated cellulose: vinyl resin films, polythene and rubber hydrochloride all give a high degree of protection. It is, however, true that under the most favourable conditions of growth some species of fungi manage to grow on almost all surfaces.

Making a Choice

Choice of a suitable fungicide for treating packages is governed by several factors, of which the most important are these:—

1. Toxicity of the chemical at the recommended concentration, *e.g.*, phenyl mercuric compounds, although extremely poisonous and also irritant to the skin, are reasonably safe at concentrations of 0.00175 per cent and can be effectively used at this strength for treating textiles and some wrapping papers. A particularly harmless fungicide is calcium propionate which has been used with some success to treat butter and cheese wrappers to inhibit mould growth.[1]

2. Fungicides suitable for treating package material by adding to the paper stock in the beater or spraying on the packed goods must possess no dermatitic action. Here again a great deal depends on the concentration of the chemical. Pentachlorophenol, for example, is liable to cause skin irritation at concentrations of 0.5 per cent, but is apparently harmless at 0.25 per cent, the strength recommended for adding to the paper stock in the beater.[2]

3. Odour is of great importance and for many products, particularly food and cosmetics, a strong smelling substance liable to taint sensitive creams, lotions, fats, shortenings, etc., cannot be used. For this reason such chemicals as menthol and thymol are not generally satisfactory.

4. Non-volatility or very low volatility is usually an essential characteristic of a good fungicide. Most successful mould inhibitors, such as salicylanilide, are completely non-volatile, but there are others, such as biphenyl and o-phenyl which are sufficiently volatile to emit traces of vapour possessing pronounced fungicidal properties. Fungicides which depend upon the vapours they emit for their protective action have proved specially useful for treating fruit wrappers.[3]

Treating Paper

There are probably a dozen or so commercial fungicides which have found application in the packaging of products for export and some, such as phenyl mercuric compounds, can be used in very low concentrations for incorporating in synthetic waxes. Others, particularly para-nitrophenol, para - chloro - meta - xylenol, trichloro-phenol and pentachlorophenol find general application for treating paper and fibre-board. The last chemical in the form of soluble sodium pentachlorophenate is used by the paper manufacturer, who precipitates the insoluble pentachlorophenol on the paper by adding alum.

Calcium propionate and also sodium diacetate have been recommended as fungicides for incorporating in the product itself; the propionate has been employed as a constituent of bread to inhibit mould growth.

For use as constituents of films, such as rubber hydrochloride and certain vinyl copolymers, there are a number of powerful fungicides, such as o-hydroxybiphenol or chlorobenzoic acid, o-chlorophenol, biphenyl and o-phenyl phenol. Very small quantities of these chemicals, less than

(*continued at foot of next page*)

Industrial Pump Pioneers

Reading Firm's Celebrations

IN 1875, a small works in Battersea (London), with 80 employees, started the manufacture of a new type of steam pump, the Pulsometer. To-day, the Pulsometer Engineering Co., Ltd., with large works at Reading (Berks.), nearly 1000 employees and branches in the large industrial towns of England, Scotland, Northern Ireland and Wales, besides world-scattered agencies, makes virtually every conceivable type of industrial pump, turbine, rotary and vacuum. This three-quarters of a century of industrial progress is being celebrated by the firm in a special sports day to-day (July 8), when for three hours from 9.30 a.m. the works are being thrown open to all employees and friends.

40 per cent Exported

The firm soon ventured in several directions to satisfy industrial needs, and the success of its undertakings has led to the creation of various pumping, refrigeration and water purification departments. Its manufactures to-day comprise some seven hundred different types and sizes of pumps for all duties. It exports to all corners of the globe about 40 per cent of its annual total output, which in 1949 amounted to over 19,500 pumps. Pumps are supplied for numerous uses to every type of industry, including heating services, food and chemical processes, paper mills, sewage, and for lubrication, drainage, borehole pumping, etc.

Prominent among the specialised types is the Stereophagus pump, first made by Pulsometer, which revolutionised sewage pumping by the incorporation of a knife to cut up solids. Newer developments are the disintegrator, with eight knives, and the solids diverter. a Pulsometer patent, which is a self-clearing automatic enclosed-tank plant for dealing with sewage in large buildings or small communities to dispense with the need of heavy and expensive installations. Most recent and highly specialised are the new high temperature oil refinery pumps, which are stated to have been supplied to all new refineries throughout the British Empire.

The firm's vacuum pumps are of particular interest. Fifty years ago no practical mechanical high-vacuum pump existed, although certain low-vacuum mercury types were in use in laboratories. Pulsometer experiments developed the Geryk air pump which gave results far beyond anything hitherto attained. This is claimed to have since made X-ray tubes, wireless valves and incandescent lamps workable propositions, and Geryk high vacuum pumps are stated to-day to work in almost every lamp and radio factory in Britain. They are also being used in delicate surgical operations, for blood transfusions, and in innumerable laboratory and factory processes.

The company's enterprise in advancing industrial and domestic techniques has been characterised by many progressive ideas since water purification plant was first produced in 1878. Its modern self-cleaning filter design has been reproduced in the U.S.A. and most other industrial countries.

Chemical Society's Library

The library of the Chemical Society will be open from 10 a.m. to 5 p.m. daily, from July 17 to September 30 inclusive, except during the fortnight August 7 to 19 inclusive, when it will be closed entirely for revision and cleaning.

FUNGICIDES FOR PACKAGE PROTECTION

(continued from previous page)

0.25 per cent, are effective as mould inhibitors.

Before using any fungicide for treating packages for foods, cosmetics and pharmaceutical products it is necessary to carry out the most thorough tests to ensure that the fungicide is safe to employ at any specific concentration. In this country and also in North America a great deal of attention has been given to the subject of mould growth and its control in packaging. The subject has attracted an exceptionally large number of investigators, including such names as Glabe, Hajo, A. J. Hall, T. F. Heynes, H. S. Holden, W. F. Horner, F. R. Koppa, H. W. Herbst, C. G. Lavers and W. I. Illman.

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[2] Carswell, T. S., and Mason, H. K., *Ind. Eng. Chem.* 30:622-26, 1938; Mason, H. K., Shumard, R. S. and Flemming J. D., *Paper Trade J.*, 110 1940.
[3] Ramsey G. B., Smith and Herberg, *Modern Packaging*, 17:113-116, Dec. 1944.

N-F METALS PRODUCTION AND STOCKS

Some Notable Increases in May

MOST Government and consumers' stocks of the principal non-ferrous metals at the end of May showed notable increases over the corresponding month last year. Among the increases (the 1949 figure shown in brackets) were:—Blister copper 43,083 tons (38,209); refined copper 81,208 (79,282); zinc in concentrates 32,855 (10,655); lead in concentrates 90 (48); imported virgin lead 60,169 (43,160); English refined lead 5154 (3500). The figure for slab zinc in all grades was down at 49,841 tons (60,741); stocks of tin metal were also slightly smaller at 14,401 tons compared with 14,843 tons in May, 1949.

Production of most kinds also showed increases, output of slab zinc being 5417 tons (4986); lead in concentrates 265 (191); English refined lead 6290 (2325); alloyed copper products 26,101 tons (22,862); copper sulphate 5003 (4093).

Production decreases were: blister copper 1526 tons (3388); refined copper 13,351 (15,389); unalloyed copper products 24,875 (25,938).

UNWROUGHT ZINC

	Long Tons: Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS: ...		
Govt. and consumers'	35,551	46,594
Imports	3,940	17,851
PRODUCTION:		
Virgin and remelted	—	5,417
CONSUMPTION:		
Virgin (incl. debased)	6,636	20,061
Remelted and scrap	—	7,180*
Exports and re-export	—	7
CLOSING STOCKS:		
Govt. and consumers'	32,855	49,841

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc., which is also included as consumption of concentrates.

LEAD

Long Tons

	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	56,416	5,061	—
Other stocks ...	78	—	—	—
IMPORTS	—	17,081	—	300
PRODUCTION ...	265	—	6,290	—
CONSUMPTION ...	253	14,084	6,197	7,990
EXPORTS		135	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	60,169	5,154	—
Other stocks ...	90	—	--	—

UNWROUGHT COPPER

	Long Tons: Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers' ...	46,815	81,089
Imports	4,508	21,444
PRODUCTION:		
Primary	—	7,730
Secondary	1,526*	5,621
CONSUMPTION:		
Primary	7,794	27,709
Secondary	—	15,700
Exports	3,304†	55
CLOSING STOCKS:		
Govt. and consumers'	43,083	81,208

* Rough Copper.

† Includes 2400 tons of rough copper despatched to Belgium and 904 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,875 long tons
Alloyed copper products	26,101 ,, ,,
Copper sulphate	5,003 ,, ,,

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	14,401
IMPORTS	90
PRODUCTION	—
CONSUMPTION	2,101
EXPORTS AND RE-EXPORTS ...	2,032

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS ...	431
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	324

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	49.25

Key Industry Duty

A TREASURY Order has been made continuing the exemption from Key Industry Duty until December 31, 1950, of all articles previously exempted until June 30, 1950, with the following amendments:

Additions: Amyl acetate, cyclohexanone, cyclohexylamine, di-cyclohexyl phthalate, 2 - diethylaminoethyl, diphenylacetate hydrochloride, *s*-dimethyl urea, guanine, quinoline, 2,4,5-trichlorophenol.

Deletions: Anisaldehyde, chloroiodohydroxyquinoline, *mono*chloroacetic acid, *o*-chloronitrobenzene, *mono*ethylamine, ethyl*iso*amylbarbituric acid, ethyl sulphate, pentachlorophenol, propiophenone, sodium ethyl*iso*amylbarbiturate, sodium ethyl *a*-methylbutyl barbiturate, sodium *a*-methylbutyl allylbarbiturate, succinic acid (but not including *iso*succinic acid), integrators (planimeter type).

DETERGENTS FROM SHALE OIL

*Synthesis from Scottish Raw Material**

SOMETHING of the chemistry of the lighter fractions of Scottish shale oil is known and many individual hydrocarbons have been identified, but there is not much information on the nature of the kerosine and gas-oil fractions of interest for the purpose under review.

Shale oil differs from petroleum in a number of important points, but of most interest in the present instance is that Scottish shale oil contains appreciable proportions of unsaturated hydrocarbons.

Some work at the Sunbury Research Station of the Anglo-Iranian Oil Company indicated that a kerosine/gas oil fraction, of boiling range 199° to 309° C. and sp. gr. 0.884, had the following constitution:[1]

	Per cent by wt.	
Paraffins	31	
Naphthenes	11	
Aromatics	16	
Mono-olefines	26	alkenes and
Di-olefines	16	cyclenes.

In planning the production of synthetic detergents from Scottish shale-oil distillates, three courses were open:—

1. Physical or chemical methods to separate olefines or paraffins, the separated hydrocarbons being used directly in the manufacture of detergents. Thus the olefines could be converted into secondary alkyl sulphates by treatment with sulphuric acid, or the appropriate paraffins might be used for the production of alkyl sulphonates via the Mersol or Hostapon processes, which were developed for use with the Fischer-Tropsch paraffins in Germany just before the second world war.
2. High-molecular-weight waxes thermally cracked to give straight-chain, liquid olefines for direct sulphation to secondary alkyl sulphates.
3. Appropriate cracking conditions employed to produce mainly gaseous olefines which could be used in the manufacture of non-ionic detergents.

The direct utilisation of olefinic constituents of shale oil appeared the most suitable route to synthetic detergents, in view of the high cost of shale oil and particularly as the unwanted portions accompanying the olefines could be returned to process, unaffected. This process also involved readily available equipment and methods traditional in the shale-oil industry, whereas physical separation of paraffins in the range necessary for use in the production of alkyl sulphonates presented considerable difficulty.

Preliminary laboratory work indicated that shale-oil alkyl sulphates had notable wetting and detergent properties, and so an oil in the kerosine/gas-oil range was divided into a series of fractions of ascending boiling range, and each of these fractions was sulphated direct with acid. As a result, it was shown that certain cuts gave superior wetting agents and detergents. It also showed that as the homologous series was ascended from C_{10} to C_{20} the water solubility of the alkyl sulphates decreased until they became practically insoluble.

A shale-oil cut was thus chosen which, on sulphation, would give the maximum yield of best-quality product, readily soluble in water and not liable to freeze out or gel during low temperature storage.

Olefines as Feedstock

At the same time fundamental work was carried out at Sunbury, using pure olefines as feedstock. This confirmed that the lower alkyl sulphates, such as dodecyl sulphate, were much more soluble in water than the higher homologues such as octadecyl sulphate. The work also indicated the optimum quantity of sulphation acid required for best results and showed that in sulphation, time of contact of hydrocarbon with acid was an important factor as regards yields, because the sulphation reaction was reversible in the presence of acid.

It was also found that in the sulphation of pure olefines, di-alkyl sulphates were formed as well as mono-alkyl sulphates and that the relative proportions of these depended on the ratio of acid to olefine and time of contact. An increase in the ratio of acid to olefine and reduction of time of contact favoured the production of mono-alkyl sulphates. Di-alkyl sulphates have no detergent properties, but the di-sulphate can be readily hydrolysed

1 Haresnape, D, and Lowry, R A "Chemical composition of Scottish shale oil distillates," Oil Shale and Cannel Coal Conference, 1950.

* Abstracted from a paper by D Stewart and E McNeill, which was read at the second Oil Shale and Cannel Coal Conference, held at the Royal Technical College, Glasgow, from July 3 to July 7. The authors acknowledge the collaboration of colleagues at Scottish Oils Ltd., and the Anglo-Iranian Oil Co, Ltd., and the companies' permission to publish the paper

to the corresponding mono-sulphate, by boiling with alcoholic potash under reflux. This can be carried out more slowly in an aqueous solution of alkali.

This work with pure olefines suggested the best conditions for adoption in the sulphation of shale-oil olefines, and corroborated much previous work in this direction.

Following further laboratory work in Scotland and at Sunbury, a pilot plant was erected at Pumpherston shale-oil refinery. This plant had a feedstock capacity of 15 gal. per batch and was intended for the investigation of process variables, to provide data for the erection of a commercial plant, and to train a nucleus of personnel in the operation of the specialised equipment required. Over 150 batches of detergent were prepared in this plant, and latterly it was used to prepare samples for appraisal until the larger plant was in operation.

From the experience gained with the pilot plant, a commercial plant was designed, and was in course of erection even while the pilot plant was still at work on some of the finer points of the process. While the pilot plant was run batchwise, many of the steps were converted to continuous operation in the larger unit.

At starting up, some initial difficulties were experienced, particularly in running the sulphation step continuously instead of batchwise as in the small-scale work, but despite this the first batch was pumped to stock in April, 1948.

In this plant the process is as follows:—

A shale-oil distillate is drawn as a side stream from the fractionating column of the distillation unit charging crude shale oil. This distillate has a boiling range of approximately 180° to 330° C. and contains small but significant proportions of both nitrogenous bases and of tar acids or phenols. These are removed by washing first with diluted sulphuric acid and then with caustic soda. The treated oil stock is then re-distilled in a smaller pipe-still unit to give the hydrocarbon feedstock, which is then passed to the detergent plant for conversion of the unsaturated constituents into water-soluble alkyl sulphates.

This feedstock is contacted with 96 to 98 per cent sulphuric acid, while the temperature is maintained at 10° to 20° C. by passing the acid-treated oil through brine-cooled chillers. The main reaction is that unsaturated components of the oil combine directly with the acid to form both mono- and di-alkyl sulphates according to the

[By courtesy of Anglo-Iranian Oil Co, Ltd

A ground floor view of the detergent plant at Pumpherston, showing lower part of neutralisers (left) and sulphation coolers (right)

following typical equations:—

$$1.\ \textit{Olefine}\quad C_{15}H_{30} + \begin{array}{c} OH \\ | \\ SO_2 \\ | \\ OH \end{array} \rightarrow \begin{array}{c} OC_{15}H_{31} \\ | \\ SO_2 \\ | \\ OH \end{array}\quad \textit{Mono-alkyl sulphate}$$

$$2\ \textit{Olefine}\quad 2C_{15}H_{30} + \begin{array}{c} OH \\ | \\ SO_2 \\ | \\ OH \end{array} \rightarrow \begin{array}{c} OC_{15}H_{31} \\ | \\ SO_2 \\ | \\ OC_{15}H_{31} \end{array}\quad \textit{Di-alkyl sulphate}$$

These alkyl sulphates remain for the most part dissolved in the oil, but a polymer tar is also formed which contains some sulphates in solution. These produce detergent solutions of poor colour, and are not recovered at present. The polymer tar is separated by means of a battery of centrifugal separators, the tar flowing to a separate plant where sulphuric acid is recovered and the organic portion of the tar prepared for use as liquid fuel.

The "sulphated oil" running into the separators is neutralised by a solution of sodium carbonate in one or more neutralisers. The sodium salts of mono-alkyl sulphates are formed with liberation of carbon dioxide:—

$$2\begin{array}{c} OC_{15}H_{31} \\ | \\ SO_2 \\ | \\ OH \end{array} + Na_2CO_3 = 2\begin{array}{c} OC_{15}H_{31} \\ | \\ SO_2 \\ | \\ ONa \end{array} + CO_2 + H_2O$$

Alkyl sulphuric acid — Sodium alkyl sulphate

These sodium alkyl sulphates immediately emulsify the unreacted oil to a cream-coloured emulsion. When the requisite quantity of sulphated oil has been run into each neutraliser the temperature is raised to 90° C. by steam-coils, and stirring continued.

Maintaining these conditions for five to six hr., the yield of mono-alkyl sulphate is increased, due to the hydrolysis of di-alkyl sulphates.

Once hydrolysis is complete, the batch is cooled and weak *iso*propanol is added to break the emulsion and to dissolve out sodium alkyl sulphates. Two layers form, the upper consisting of unreacted oil and alcohol, while the lower is an alcoholic solution of sodium alkyl sulphates with unreacted mineral oil and excess alkali. The two layers are run down and stored in separate receivers.

Alcoholic Oil Layer

The alcoholic, unreacted oil layer is stripped of alcohol in a continuous, steam-heated stripper, the alcohol vapour being condensed for re-use, and the oil returned to the refinery for processing to diesel oil.

The alcoholic detergent layer contains a proportion of mineral oil, and this is removed by counter-current washing with a special-boiling-point solvent spirit.

The washed alcoholic detergent solution contains solvent spirit in place of oil, and both alcohol and solvent spirit are removed and the detergent concentrated by continuous evaporation in a set of three steam-heated evaporators arranged in cascade.

These evaporators control the frothing which occurs in boiling this type of detergent solution. The alcohol and solvent-spirit vapours passing overhead from the evaporators are condensed, and the components separated and run to storage tanks for re-use.

The concentrated detergent solution, free from alcohol and solvent spirit, leaves the evaporators as a syrupy liquid.

The offtake from the evaporators is blended in batches to the required concentration, and the pH value is adjusted to 7.5—8.5 by the addition of dilute sulphuric acid. Finally, the batch is filtered through a pressure filter before passing to storage, a filter aid being added in small proportion to the steam as it enters the filter.

The filtered product is conveyed through ebonite-lined steel pipes, but more recently either stainless steel or Monel piping has been used.

The storage tanks at first erected were of steel lined with Polythene, sprayed on by the Schori powder process. New tanks now in use are constructed of stainless-clad-steel plates. From the storage tanks, the finished detergent is pumped to the filling points via displacement meters constructed of stainless steel throughout. Despatch is either in 20-oz. domestic bottles, 1-gal. stone jars, or wooden barrels of from 5 to 40 gal. capacity. Quantities are also dispatched by road car, normally of aluminium or stainless steel.

Chemically, this detergent is an aqueous solution of organic active agents, predominantly of the alkyl sulphate type. In addition, the product contains not more than 5.5 per cent of inorganic salts, principally sodium sulphate.

Swiss Chemical Exports

An increase is reported in Swiss exports of chemical and pharmaceutical products from Swiss Fr. 35.9 million in April to Fr. 42.2 million in May. The most marked increase, from Fr. 13.2 million to Fr. 17.9 million, occurred in exports of dyestuffs and the next largest was in pharmaceutical products, with Fr. 16.8 million (15.8 million). Industrial chemicals rose by Fr. 1 million to Fr. 6.2 million, but exports of perfumery declined from Fr. 1.7 million to Fr. 1.5 million.

THE FULLER USE OF COAL TAR

Re-assessment of Potentialities Necessary

by M. KAUFMAN, B.Sc., A.R.I.C.

IT is in the nature of a paradox that coal tar, so often referred to as "the treasure house of organic chemicals," is treated as something of a stepchild in the family of coal and coal products. In spite of the indispensable substances it yields, it still retains the status of a by-product rather than a raw material in its own right. Yet it is one of the few indigenous raw materials we possess and is available in quantities of over two million tons a year.

These reflections are occasioned by the problems that are currently facing the tar industry and by the urgent need to use our national resources to the full.

Tar is one of the volatile constituents obtained, with gas and ammoniacal liquor, in the carbonisation of coal. It accounts for about 5 per cent by weight of the charge but varies considerably in yield and character, depending on the purposes for which the coal has been treated. About 60 per cent of the total production derives from gas making while over 30 per cent comes from coke ovens.

In normal distillation tar is resolved into a number of fractions as shown in the diagram. This indicates the approximate yields of the various cuts but they are not intended to be precise. Temperature ranges indicated are not strictly adhered to; they fluctuate in accordance with market requirements as well as with local practice. They depend, moreover, on the type of coal used and they vary in their relative proportions with the method of carbonisation. This last consideration is the most important from the point of view of the yields as well as of the character of the resultant tar.

TAR

Light Oil	Middle Oil	Heavy Oil	Anthracene Oil	Pitch
4%	17%	9%	10%	60%
Up to 190°C.	190-230	230-270	270-350	>350°C.

Broadly speaking, for a given coal, the higher the temperature of carbonisation and the longer the time of exposure of the tar to this temperature, the more aromatic it will be and the greater its pitch content.

Still for isolation of high boiling constituents from anthracene oil

The quantity of acid and base constituents will also be affected. It is thus possible to predetermine to some degree the tar content. Of the three main types of retort in use, horizontal, vertical and coke oven, the last is most suitable for the subsequent extraction of chemicals.

An increasingly important and promising department is the so-called low temperature tars, those produced at 450-700°C. These differ very considerably from the other types in that they are more aliphatic in character and contain relatively large quantities of phenols. The tonnage made is very small as compared with the high temperature tars. (continued overleaf)

Listing the individual substances obtained from tar, as worked at present, discloses that they are very few, in spite of the enormous variety of materials which are ultimately derived from them. The following are the most important:—

1. Benzene. An organic chemical which is the basis of many industrial syntheses.
2. Toluene. A solvent and constituent of the explosive TNT.
3. Xylene. A solvent used in paints and varnishes.
4. Naphtha. A solvent.
5. Pyridine. Used in pharmaceuticals and in the denaturing of alcohol.
6. Phenols and cresols. Constituents of the Bakelite type of plastics; basis for nylons and antiseptics.
7. Naphthalene.—Used in the production of phthalic anhydride for synthetic resins.
8. Anthracene. Used in "40 per cent paste" as basis for dyestuffs.

"Treasure House of Chemicals"

The first five of these substances all come from the "light oil" fraction (in addition to some scrubbed out of the gas) and, as the diagram indicates, they account for less than 4 per cent of the tar. The phenols and cresols make up less than 2 per cent, while 40,000 tons of naphthalene and 8000 tons of anthracene are extracted from a total annual production of about 2½ million tons. Overall then, about 7 per cent of the tar is used as a source of chemicals; not a very impressive figure for the "treasure house of chemicals."

The other 90 per cent, consisting of the creosote, anthracene oil and pitch, is used for such purposes as fuel, road surfacing, timber preserving and so on. All, broadly speaking, are materials of low economic value. It is this part of the tar, however, which provides the bulk of the revenue of the industry and these are the products which are most exposed to the competition of the rapidly expanding petroleum refining projects in this country.

Increasing Competition

The scale of the growth of the competing industry can be gauged from the fact that by 1953 plant with a capacity of 19 million tons of finished product will have been erected, as compared with the present throughput of about 8 million tons a year.

The petroleum industry is competitive with tar throughout almost the whole field of application. Bitumen serves for road dressing, as does road tar, while heavy petroleum oils can and do compete with tar oils and pitch-creosote mixture as fuels. In the lighter fractions white spirit is comparable with naphtha.

The United States now prepare phthalic acid and anhydride by the oxidation of *o*-xylene, a petroleum product, as well as from naphthalene, and during the war toluene was prepared in large quantities by the catalytic dehydrogenation of methylcyclohexane.

A more direct threat to home markets in the purely chemical field comes from the operation of the Catarole process by Petrochemicals, Ltd. This is known to produce a range of chemicals from benzene, toluene, etc., to the higher polycyclic aromatic compounds. The extent to which these will be exploited remains to be seen, but the lower boiling aromatics are already on the market at competitive prices.

The main threat of petroleum, is, however, to the oils and pitch of tar, as well as road tar itself, and it is on these that attention will have to be concentrated.

A factor which cannot be ignored when assessing the prospects of the tar industry, is the likelihood of diminishing export markets. Our industry is being subject to increasing competition from abroad, more particularly from the revived German coal and chemical industries, and this will be bound to effect the outlets for tar and its products.

Other Uses

These increasingly competitive conditions invite a re-assessment of the possibilities and potentialities of coal tar. Is this raw material being exploited to the full, and if not, how can it be made to yield more? Are the technical methods used by the industry of the kind to ensure maximum extraction of the substances already obtained from tar? Is the chemical industry fully aware of the large range of materials available in tar and can it be stimulated to make fuller use of them?

The first of these questions finds a partial answer when attention is paid to the tar prior to distillation. For example, could not the blending of gas and coke oven tars be avoided, where the tar is a very good source of chemicals? Would it not be possible, within the limits laid down by gas and coke manufacture, to make some changes to secure optimum conditions for tar production?

It has to be admitted, however, that no great change can be anticipated in the character of the tar coming from the gas making or coke oven retorts. That does not necessarily imply that we must accept it as it stands. The great petroleum industry would never have reached its

present position if it had accepted such limitations. Flexibility is the great feature of petroleum refining, and its instrument has been the bold application of such chemical processes as cracking, isomerisation, cyclisation and so on. If tar has certain deficiencies as a raw material, why should we not have a shot at rearranging its molecules to suit our own requirements?

It is evident that the maximum potential even of tar as it comes now is not being realised. Over 50 per cent of tar is distilled in old fashioned inefficient pot stills. The full extraction of those substances worked up now is impossible, let alone the isolation of some of those present in smaller quantities.

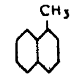
The more widespread use of modern pipe stills would allow much higher yields, and therefore lower costs, of such products as naphthalene and anthracene, while closer fractionation on high efficiency fractionating columns would make it possible to isolate on a commercial scale such compounds as indene, the bases picoline, lutidine and collidine, dicyclopentadiene and a number of others.

The extension of this technique to the higher fractions of coal tar would no doubt be profitable. From a technical point of view the extraction of chemicals from these oils is quite feasible, for it is known that fractional distillation under reduced pressure can be extended to include constituents with boiling points in the region of 350°C.

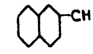
Dr. Kruber, in Germany, has done much work in this field, which he has reported quite fully[1]. and has demonstrated that there is a whole range of chemicals which can be isolated without undue difficulty. Nor is he alone. Reilly Coal Tar Chemicals in the U.S. and Powell Duffryn Research Laboratories among others in this country have confirmed this.

Some chemical individuals which are thus made accessible in significant quantities are given, with their formulæ.

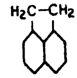
α methyl naphthalene



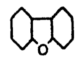
β methyl naphthalene



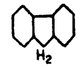
Acenaphthene



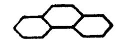
Diphenylene oxide



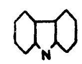
Fluorene



Phenanthrene

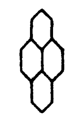


Carbazole

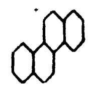


Fluoranthene

Pyrene



Chrysene



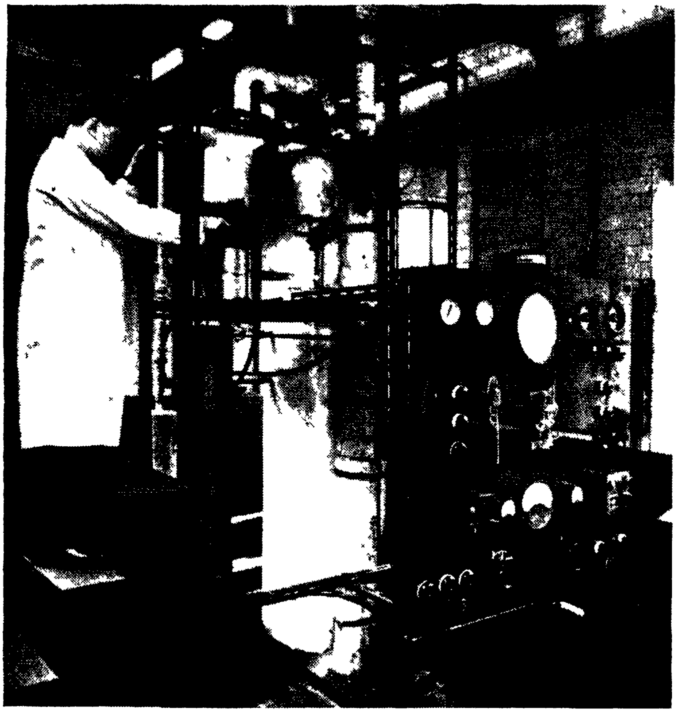
Fresh Outlets

Apart from these individual compounds, interesting and useful oils can be obtained which might be used for high boiling solvents, among other purposes.

From the chemist's point of view, the compounds listed form the starting point for the synthesis of materials used in various branches of industry. Acenaphthene, for example, can be used as a dyestuffs intermediate, it may be converted to acenaphthylene, which polymerises and copolymerises to give plastics of improved heat resistance or it can be oxidised to 1.8 naphthalic acid, which is analogous in structure with the very valuable phthalic acid. Alpha methyl naphthalene may be converted to a plant hormone, while β methyl naphthalene can be used as a basis for the synthesis of the antihæmorrageic vitamin K. Carbazole dyestuffs such as Hydron Blue and the plastic known as Luvican indicate outlets for yet another member of this group of chemicals. Pyrene by oxidation readily yields the tetra carboxylic acid of naphthalene, a dyestuff intermediate.

One could continue to add to this list of possible applications, though it has to be noted that Dr. Kruber, as a result of his experience in trying to dispose of relatively small quantities of some of these chemicals, was disappointed by the smallness of the response he met.

This is perhaps a reflection on the slowness of the chemical industries to appreciate the potentialities, but it is reasonable to suppose that if large quantities were made available at moderate prices the challenge they would present to the ingenuity of the organic chemist would not go unanswered. This is precisely what the higher fractions



The head of a ***high*** *efficiency* ***fractional*** *distillation* ***unit***

(Both photographs by courtesy of the Powell Duffryn Research Laboratories, London)

of coal tar offer, for if these substances are available only to the extent of 0.5-1 per cent of the tar they still represent a potential output of several thousand tons a year.

The fuller exploitation of tar, from the chemical point of view, would thus considerably upgrade its value. This approach, however, does not exhaust the possibilities of dealing with the present position. It may not even be the most important. The biggest part of the tar will continue to be absorbed by the "bulk" applications, and therefore research work will have to be directed to improving them.

It is certain that only the greater use of scientific and technical advances will enable the industry to cope with the problems which appear to lie ahead. Perhaps, in the long run, the threat of increased competition will be the spur to exploiting the full potential of one of our major national assets. The recent establishment of the Coal Tar Research Association appears to have brought that prospect appreciably nearer.

[1] Survey of New Materials in Coal Tar. *Angew. Chem.* *61*, 59-63, 1949

Defence Science Conference

THE promotion of scientific research in all branches of defence by closer collaboration within the Commonwealth is the object of a meeting of the Commonwealth Advisory Committee on Defence Science which opened in Cambridge this week and will continue until July 20. This is the first occasion that scientists have met under the new committee, on which are representatives from the United Kingdom, Canada, Australia, New Zealand, South Africa, India and Pakistan. Sir Henry Tizard is presiding.

Sillimanite for Ceramics

VISITORS to the ceramic engineering laboratory at Clemson College, South Carolina, are invited to fling cups and saucers against the concrete walls—and are surprised to find no breakages. The laboratory's ceramic experts have produced what they claim is an unbreakable and lightweight porcelain. It is composed chiefly of sillimanite, the mineral discovered about 12 years ago by a soil conservaton expert in South Carolina. So few deposits are known that these cups and saucers are not yet marketed.

ORGANIC SOLVENT MANUFACTURE

*Methods Recently Developed in Great Britain and the U.S.A.**

IN the field of petroleum solvents the technique of precise fractionation has been continuously developed, with the result that it is possible to obtain such products as cyclohexane, methyl cyclohexane and dimethylcyclopentane by direct fractionation. Benzene and toluene are produced by the catalytic dehydrogenation of cyclohexane and methylcyclohexane respectively, toluene being also produced by isomerisation of dimethylcyclopentane and purified by extractive distillation.

The most interesting field of solvent manufacture is the synthesis of various ketones and alcohols which were formerly derived from natural sources or fermentation processes. The base materials are the lower unsaturated and saturated hydrocarbons, with the more general use of the olefines ethylene, propylene and the butylenes, rather than the paraffins, which are not so reactive.

One of the chief sources of these gases is the waste gas from petroleum refineries where cracking is being carried out and where the considerable amount of gas produced includes hydrogen, methane and higher compounds. The gas stream may be separated into cuts by straight fractionation or by absorption and fractionation together.

Hypersorption

In this respect, the latest development is to absorb the lighter gases selectively on to activated charcoal and then strip them from the adsorbent. This process, called hypersorption, can give a recovery of 98 per cent ethylene, of 92 per cent purity, from a mixed stream of hydrogen, ethane, methane, propane, ethylene and propylene. In addition, some hydrocarbons can be incorporated straight into petrol, or by alkylation or isomerisation.

Another process for the manufacture of solvents is the direct oxidation of natural gas hydrocarbons, after suitable cuts have been achieved by compression, absorption and distillation. Rigid conditions of temperature and pressure, charge rate and gas-hydrocarbon ratios are essential, as also is the catalyst used. The crude product contains many things difficult to separate, formaldehyde, ethanol and methanol, acetic acid and acetone, and the propanols and butanols.

These products are separated by simple distillation with close fractionation, selective solvent extraction, evaporation, azeotropic distillation, adsorption and absorption, etc. In some cases oxidation of the isolated materials is employed to give products found only in small quantities in the primary step. The oxidation of propane, which is typical, gives *n*-propyl alcohol, propionic acid, propionaldehyde and acetone, among other things.

Advantages of Oxidation

The direct oxidation of paraffins is a delicate operation and final separation is difficult and costly; synthesis from the olefines is a much simpler process. The main advantage of the oxidation process in the U.S. is the cheapness and abundance of natural gas. In this country, however, there are no large natural gas reserves, neither are there large supplies of refinery gases, though the refineries scheduled to start production in 1952 should provide a considerable amount of gases for the synthesis from olefines.

Cracked gases contain a high percentage of ethylene in addition to propylene and butylenes. The ethylene may be separated by fractionation, but the distillation is inconvenient and refrigeration expensive. An interesting alternative method is developed by the Union Oil Co., in which hydrocarbons are selectively adsorbed on a moving bed of activated charcoal and then subsequently removed from the charcoal by heat treatment and steam stripping.

The control of the process depends on the principle that, because the heavier components are more readily adsorbed than the lighter, the temperature of the activated carbon bed is characteristic of the materials being adsorbed at any point. The take-off is regulated by a temperature controller operating on the sharp temperature break in the rectifying section caused by the gas adsorption.

The light gases are removed from the top of the rectifying section, while some of the gas is allowed to pass up through the cooling section down which the carbon stream is descending. The gas is removed from the top of the hypersorber and used as the

* A condensed abstract of the Royal Institute of Chemistry paper, " Modern Methods of Organic Solvent Manufacture," by Dr. J. L. Edgar, who acknowledges his debt to the Shell Chemical Corporation of America for permission to use previously unpublished data.

lift to carry the moving carbon bed back to the top again. A bleed stream is taken from the lift gas and used to control the fines formed in the carbon by attrition.

The process is capable of recovering very pure ethylene from a gaseous mixture containing hydrocarbons up to and including propane and propylene. In the presence of heavier components there is, however, the tendency for polymers to form on the surface of the carbon, poisoning and deactivating it.

Direct Hydration of Ethylene

Ethylene is converted into ethyl alcohol either by direct hydration or by reaction with sulphuric acid and subsequent hydrolysis of the alkyl esters. The direct hydration method consists of passing ethylene and steam in the vapour phase at high pressures over a catalyst. This method was first operated on a commercial scale by the Shell Chemical Corporation of America.

In a typical plant which uses the sulphuric acid method, ethylene is absorbed in a counter-current tower down which flows 97.5 per cent sulphuric acid at between 200 and 500 p.s.i., and at 80° C., the heat of reaction being absorbed by built-in cooling coils. The acid, which contains diethyl sulphate and ethyl hydrogen sulphate, is diluted with water and the esters hydrolysed.

The crude alcohol is stripped by steam, the acid leaving at about half strength, and the alcohol vapours are scrubbed with caustic soda, condensed, and distilled. The crude alcohol passes first to an ether column in which the by-product ethyl ether is removed from the top and then back washed with water to remove final traces of alcohol. The ether-free alcohol passes to a rectifying column where the finished alcohol is taken off overhead as an azeotrope containing 95 per cent by weight of alcohol. The chief disadvantage of this process is the necessity for re-concentration of the sulphuric acid used.

Ethyl Chloride

Ethyl chloride is made directly from ethylene by the action of anhydrous hydrogen chloride in the presence of a catalyst, crude ethyl chloride being being separated by distillation and purified by two-column distillation. The process requires corrosion-resistant equipment.

Ethylene oxide, another important derivative, is made by chlorhydrinating ethylene with hypochlorous acid at below 10°C. Ethylene chlorhydrin produced is hydrolysed with lime, which splits off HCl and gives ethylene oxide, which is purified by distillation.

$$CH_2 = CH_2 + HOCl \rightarrow$$
$$HOCH_2CH_2Cl \rightarrow \underset{\diagdown O \diagup}{CH_2 - CH_2} + HCl$$

Ethylene glycol is produced by treating ethylene oxide with water in the presence of sulphuric acid.

$$\underset{\diagdown O \diagup}{CH_2 - CH_2} + H_2O \rightarrow \underset{OH}{CH_2} - \underset{OH}{CH_2}$$

The glycol may be oxidised by passing it in the vapour phase over a copper catalyst at 250°C. in excess air. Glyoxal, a valuable intermediate, is formed.

$$\begin{array}{l} CH_2OH \\ | \\ CH_2OH \end{array} + O_2 \rightarrow \begin{array}{l} CHO \\ | \\ CHO \end{array} + 2H_2O$$

A new Shell plant soon to start operation at Stanlow will produce a wide range of solvents. The feedstock is gas oil and the working conditions allow the cracked residue to supply the fuel requirements of the entire plant.

Cracking

Cracking is carried out in the vapour phase at high temperature and low pressure, and the products are separated into two fractions. The light fraction, which has an end point of 190° C., is separated into fuel gas containing all the hydrogen, ethane, methane and ethylene; a highly pure C_3 cut, containing 92 per cent propylene; a high purity C_4 cut; a C_5 cut which is re-cycled; and an aromatic distillate containing high percentages of benzene and toluene.

The separation process consists of compressing the vapours from the cracking unit and then feeding these, together with the liquid, to an absorber stripper in which the heavier components are absorbed in a portion of aromatic distillate. The overhead gases are free of pentanes and, after removal of H_2S in diethanolamine solution, are compressed and dried. They are then fed to a fractionating system of an ethane column, a methane column and a propane column.

Propylene from the olefine synthesis method requires only a wash with caustic soda to remove mercaptans and traces of H_2S. But the C_4 stream contains butadiene and *iso*butylene, both of which must be removed prior to solvent manufacture.

Alcohols are synthesised by treating the olefines with sulphuric acid, hydrolysing the mono- and di-alkyl esters produced and stripping the crude alcohols from the dilute acid with steam. The water molecule entering the olefine molecule distributes itself so that the hydroxyl group

attaches to the carbon atom having the least number of hydrogen atoms attached to it. In this way only secondary and tertiary alcohols are produced. The acid reaction is slow and requires time tanks without heat, because the effect of temperature, which would increase the rate of reaction, also produces undesirable ethers and polymers. The strength of the acid used depends on economic considerations.

Distillation of the crude alcohols is complicated because *iso*propyl, secondary butyl and tertiary butyl alcohol all form minimum boiling point azeotropes with water. The anhydrous alcohols are obtained by distilling them with a water carrier which forms a low boiling ternary azeotrope; the water is thus carried overhead.

Ketones are produced from the alcohols by catalytic dehydrogenation in the vapour phase at high temperatures. *Iso*propyl alcohol on dehydrogenation gives acetone,

$$\begin{matrix}CH_3\\CH_3\end{matrix}\!>CHOH \rightarrow \begin{matrix}CH_3\\CH_3\end{matrix}\!>C=O+H_2$$

Secondary butyl alcohol yields methyl ethyl ketone,

$$\begin{matrix}CH_3CH_2\\CH_3\end{matrix}\!>CHOH \rightarrow \begin{matrix}CH_3CH_2\\CH_3\end{matrix}\!>C=O+H_2$$

From acetone, diacetone alcohol can be made by passing over a suitable catalyst at low temperatures,

$$\begin{matrix}CH_3\\CH_3\end{matrix}\!>C=O+O=C\!<\!\begin{matrix}CH_3\\CH_3\end{matrix} \rightarrow$$

$$CH_3-\overset{\displaystyle OH}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3$$

Diacetone alcohol can be dehydrated with a suitable catalyst to give mesityl oxide,

$$CH_3-\overset{\displaystyle OH}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_2-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3 \rightarrow$$

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3+H_2O$$

A recent process started by the Shell Development Corporation of America is the manufacture of allyl chloride by the direct chlorination of propylene, which is now an initial step in the manufacture of synthetic glycerol. Very pure propylene must be used, and it is chlorinated non-catalytically in the vapour phase at 500°C., at pressures just above atmospheric. The reaction is highly exothermic and takes place in adiabatic reactors with a very short residence time.

There are two methods of converting the allyl chloride to glycerol. The first, briefly, is the chlorhydrination of refined allyl chloride with dilute hypochlorous acid, or a dilute aqueous solution of chlorine, and then hydrolysis with caustic soda to give glycerol. The other method is to chlorinate the allyl chloride further in dilute aqueous solution so as to produce trichloropropane, which may then be hydrolysed to give glycerol.

This production of allyl chloride and allyl alcohol has opened the way to a vast new field of solvents and chemicals, which is probably destined to become of exceptional importance. Among the products that are now being made available are epichlorhydrin, a starting material for the manufacture of solvents for resins, gums and cellulose esters; and acrolein, which, though not a solvent, is a most important intermediate in the synthesis of other chemicals and solvents.

Expansions in Pakistan

THREE sulphuric acid plants, two with a capacity of 10 tons daily and one of 20 tons capacity, will soon be operating in Western Pakistan. They will be located at Karachi, Lyalipur and Rawalpindi (West Punjab). A 10-ton plant for the production of caustic soda by the electrolytic method is also to be established in the near future. This will produce 8.8 tons of chlorine per day. As an additional means of ensuring the regular supply of chlorine for Karachi, the Government has agreed to the establishment of a four-mercury cell plant capable of producing approximately five tons of chlorine per month.

Another matter to which importance is attached by the Pakistan Government is the establishment of a national fuel research institute. Detailed proposals for this have been made by a Czechoslovakian firm, and have been examined and accepted in broad outline by the Government.

Pakistan's production of various petroleum products, which stood at 42,000 tons in 1948, rose to 90,000 tons in 1949 and is expected to rise to 180,000 tons this year. Development of the oilfields of the Punjab, which will enable Pakistan to meet 15 per cent of its total requirements, is to be accelerated.

"Proposed New Hardness Scale"

In the article appearing in last week's issue (*1616*, page 20) under "Krushchov's Scale" the formula was given incorrectly as $H_0 = 0.7H^3$. This should have been $H_0 = 0.7H^{\frac{1}{3}}$.

Compounding Synthetic Rubbers

Widespread Application of the Zinc Pigments

ZINC pigments play a vital part in the compounding of nearly all rubbers, whether natural or synthetic. Zinc oxide is used as an accelerator, as an activator, as a pigment and for reinforcing. Zinc sulphide and lithopone are most useful as pigments, although lithopone can exhibit quite marked reinforcing effects.

The characteristics of each kind of pigment and the various ways in which they are applied are described and illustrated in "Zinc Pigments in Rubber," the latest publication of the Zinc Development Association.

Among other metallic oxides occasionally used as activators, this review observes, only cadmium and lead oxides have effects comparable to those of zinc oxide. The cost of the former renders it prohibitive for all but very special purposes.

Disadvantage of Litharge

Lead oxide (litharge) has the serious disadvantage of darkening or blackening the product. While this oxide does activate most accelerators, with others it exerts a retarding effect. The lead content of zinc oxide must be kept low to avoid darkening and inequalities in curing properties.

Cadmium compounds retard thiuram accelerators and slightly advance the cure with butyraldehyde ammonia, diorthotolyl-guanide and mercaptobenzothiazole.

Zinc pigments are an essential ingredient in the compounding of practically all synthetic rubbers, observes the ZDA. It classifies these rubbers and some of these properties thus:

Butadiene-styrene rubbers (GR/S) are the greatest competitors of natural rubber and were used extensively during the war. Channel blacks of the type most frequently used with natural rubber are capable of giving high tensiles with GR/S, but there are so many processing difficulties that the so-called easy-processing (EPC) blacks, with or without soft blacks are much more common.

Several workers have found that mixtures of easy-processing black and zinc oxide give higher tensiles than the black alone. A more important discovery, however, was that replacement of one-third of the channel black by zinc oxide reduced heat build-up. The reduction in heat build-up was judged from work on a modified form of flexometer, which is believed to reproduce road test conditions better than some of the instruments used.

Butadiene-acrylonitrile rubbers (GR/A), of which the chief representatives are Hycar and Perbunan, in general swell in oils less than any other rubber except Thiokol. The compounding of these synthetics closely resembles that of GR/S, the chief point of difference being that with GR/A it is usually desirable to use fairly high proportions of plasticiser such as dibutyl phthalate, etc.

Butyl rubber (GR/I), now available in a number of grades, finds its chief application where very low permeability to gases is required as in chemical linings, or where the product will come into contact with strong oxidising agents in service.

Neoprene (GR/M) is the most resistant of all synthetic rubbers to oxidation, sunlight, flame and flexing. It is also highly heat resisting and has only limited swell in most solvents. This swell seldom causes disintegration such as occurs with natural rubber in contact with oils, etc. The function of zinc oxide in this synthetic is totally different. It can be regarded as the main curing agent, thus taking the place of sulphur in natural rubber and the butadiene synthetics.

Oil Resistant

Thiokol (GR/P). The class of synthetic rubbers known as Thioplasts are the most highly oil resistant of all synthetic rubbers. They require zinc oxide in order to cure. Quite small amounts appear to be sufficient, but the makers recommend that a minimum of 10 per cent on the Thiokol be used.

Lactoprene is the generic name covering a very recently developed range of copolymers of acrylates with butadiene, etc. Zinc oxide is here used as a reinforcing agent.

Zinc oxide, says the ZDA report, has been shown to be a most versatile material in compounding both natural and synthetic rubbers. With regard to its behaviour in synthetics—some of which are procurable only in very small quantities—it is highly probable that continued investigation of the compounding and processing technique of synthetic rubbers, together with fuller investigation of different types of zinc oxide, will reveal new uses.

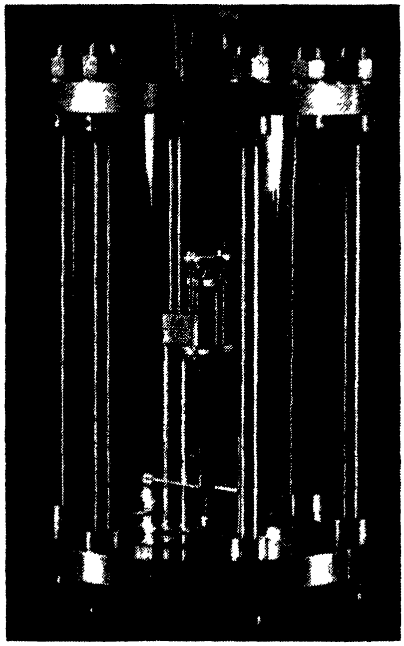
SUCCESSFUL IMPROVISATION

Sensitive Pressure Controller in Hydrocarbon Synthesis

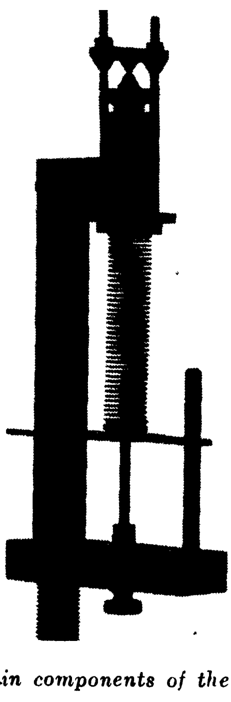
THE possibilities of effective improvisation in chemical engineering were well illustrated recently in the Fuel Research Station of the Department of Scientific and Industrial Research in an instrument produced by Mr. Jack Death, one of the oldest employees there (both in age and service) who devised and made a very sensitive pressure controller. This was aided by his intimate appreciation of the stringent conditions imposed by a newly installed synthesis plant.

This is an experimental fluid bed plant for hydrocarbon synthesis by the Fischer-Tropsch process. It is at present operating at 20 atmospheres pressure, handling flow rates between 2 and 60 cu. ft. per hour, but it may be run at pressures up to 50 atmospheres. The pressure of gas in the apparatus requires to be held constant within very close limits at any level selected, irrespective of the rate at which the gas is flowing from the plant.

Mr. Death had been working for many years on the construction and maintenance



The assembled pressure controller in use at the Fuel Research Station. Glass enclosed, it has a low pressure gas outlet at the top



The main components of the valve

of hydrogenation and synthesis plants, and the original prototype without any modification, which is still in operation after several months' service, represents his own ideas as to the type of controller required in the particular circumstances.

The basic principle of the device is the use of a ball valve held on its seating by a tension spring. This idea is by no means novel—it was probably known to the Romans. Mr. Death has applied his craftsman's skill and knowledge to this well known principle and has succeeded in producing an instrument so efficient that it is being installed throughout the Fuel Research Station wherever sensitive pressure controllers are required.

The high pressure gas comes up through a stand pipe in a glass container. It leaves the stand pipe by a ball valve which is retained in position by a stirrup connected

to a tension spring. The lift of the ball is limited by adjusting to about 0.01 in. the clearance between the lower bar of the stirrup and the stand pipe. The ball housing is coned so as to allow a free escape of the gas into the low pressure receptacle.

The controller is capable of maintaining a pre-selected pressure for indefinite periods, virtually no supervision being required. A certain amount of light oil is exhausted with the gas from the synthesis plant, and the apparatus has proved to be a very efficient oil-fog separator. With 45 turns of a 20 s.w.g. close-coiled, hard-drawn stainless steel wire, the controller is capable of efficient operation with hydrogen at rates of flow ranging from about 5 to 500 cu. ft. per hour at 10 atmospheres, 5 to 900 at 20 atmospheres, and 5 to 1200 at 80 atmospheres.

With 45 turns of a similar wire of 18 s.w.g. the range for hydrogen is from 5 to 1400 cu. ft. per hour at 20 atmospheres, 5 to 2200 at 40, 5 to 2500 at 60. With 18 s.w.g. the range with air is up to 400, 700 and 800 cu. ft. per hour at 20, 40 and 60 atmospheres respectively. These are the extreme limits obtainable with the particular springs on test. For all these rates and pressures the diameter of the stainless steel ball is 1/16 in. When controllers are installed to handle appreciably larger rates of flow, a slight increase in the diameter of the ball is required.

It is not claimed that at the extreme limits quoted the pressure remains constant, because there is a tendency to rise. For example, at 20 atmospheres, a controller fitted with a 20-gauge spring is able to maintain a practically constant pressure at rates of flow up to 800 cu. ft. per hour. There is then a rise in pressure of about two atmospheres up to 900 cu. ft. per hour. With air, this rise in pressure is about three times what it is with hydrogen at the same rate of flow.

This sensitive pressure controller was displayed at the recent Physical Society exhibition and attracted considerable attention, inquiries being received from some very large concerns. It is considered that, on account of its simplicity and reliability, it should be suitable for any applications where a sensitive pressure controller is required.

Standardised Pumping Equipment

NEED for standardisation and interchangeable components is nowhere more apparent than in the provision of pumping services in the large petrochemical undertaking of the Shell group at Stanlow. The measures taken by Sigmund Pumps, Ltd., to meet that need are recorded in a booklet now available.

The large number of pumps involved created a considerable maintenance problem, as it seemed impracticable to have available a spare pump for each duty, as is often done in refineries. All the duties to be performed were, therefore, tabulated and then grouped. Thus, three basic pump designs were selected; a single-stage pump, a two-stage pump and a multi-stage barrel pump. Within these groups steps were taken to keep variations of parts to a minimum by employing the same internal parts in all three groups. There are single-stage, two-stage and multi-stage barrel pumps all employing the same impellers and wear rings, and between single- and two-stage pumps only one bearing assembly is used.

Over three-quarters of all the pumps have only two sizes of bearing assemblies in single- and two-stage pumps. Problems of maintenance during operation are much facilitated by this method and the work of storekeeping reduced to a few categories.

New Petroleum-Based Fungicide

A PETROLEUM-BASED fungicide SR-406, said to be effective against most of the important fungous diseases of plants, is reported to have been successfully developed by the Esso Laboratories of the Standard Oil Company (New Jersey)—where it is expected to be produced commercially in 1951—in co-operation with Rutgers University. Technically, it is N-trichloromethylthio-tetrahydrophthalimide. The Rutgers reports indicate that in tests on potatoes and peaches using solutions from 1 to 10 p.p.m. even the weakest solution prevented about 50 per cent of the fungus spores from germinating, without injury to plants.

Replacing Milk of Lime

The experimental use of Elguanite, said to be a mixture of carbonates, hydroxides and trace elements, to replace milk of lime in sugar-refining, is reported from Hawaii and the U.S.A. It is claimed that the long filtering process, necessary when milk of lime is used to precipitate impurities, is avoided by use of Elguanite. It is also said that clogging of the filters is eliminated and that more sugar is actually produced because Elguanite does not cause raw sugar to turn to molasses, which can occur when milk of lime is used.

Technical Publications

RESULTS of applying electromagnetic and cathode-ray oscillographic recording techniques to the study of certain electrical parameters in the a.c. argon arc process for welding aluminium are given in a paper by L. H. Orton, J. C. Needham and J. H. Cole in the June issue (Vol. 4, No. 3) of *Welding Research,* journal of the British Welding Research Association. Recommendations are also given for the metal-arc welding of butt welds in steel pipe-lines for power plant.

* * *

TRANSLATIONS of German technical data for the manufacture of the wide range of dyestuffs produced by the I. G. Farbenindustrie have been made in a series of reports now listed in research bulletin No. 46, available from the Research Information Service, New York.

* * *

VERSATILE polythene is the subject of an article by Philip A. Novikoff in the June issue of the "C.I.L. Oval" (Vol. 19, No. 3) published by Canadian Industries, Ltd. Other features include a review of the important part played in industrial development by Canada's caustic soda and chlorine production, and the work of the chemist in improving mothproofing and moth control.

* * *

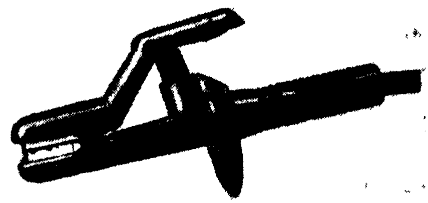
WIDENING uses of a large range of chemical products resulting from continued research and investigation are described in a booklet just issued by the Witco Chemical Co., Ltd. Its intention is to supply in compact form a reference, neither too technical nor too commercial, which may be of use to the buying department and the development chemist.

* * *

CASTINGS in nickel-aluminium bronze as specified in B.S. 1400-AB2-C are comprehensively dealt with in a booklet just issued by The Mond Nickel Co., Ltd., London. Composition-fatigue and corrosion-fatigue properties, machining, welding, brazing and soldering are the subjects of technical reviews amplified with illustrations and diagrams.

* * *

THE engineering achievement which brought the waters of Lochaber to Fort William to generate the hydroelectric power necessary to manufacture aluminium, is the subject of an interesting illustrated article in the current issue of "Rope Talks" (No. 23) published by British Ropes, Ltd.



[By courtesy of Murex Welding Processes, Ltd

An electrode holder (type H500) intended to withstand the arduous conditions of heavy duty electric arc welding. It is suitable for currents up to 500 amp., the holder has special long life jaws, overall insulation, and all parts are replaceable. A heavy-duty instrument, it weighs only 24 oz.

USE of chemical fibres in a new context by the Celanese Corporation of America is announced in a leaflet describing the successful application of these fibres, either blended with wool or alone, in the manufacture of carpets. It is claimed that these fibres make possible colour tones of greater brilliance and clarity than have formerly been possible to the rug industry.

* * *

DISCOVERIES which made possible the building up of the chlorantine fast-colour dyes through the introduction to azo chemistry of the cyanuric ring are described in the June issue of the "Ciba Review" (No. 80) published by Ciba, Ltd., Basle. The main feature article is devoted to the history and development of the Lucchese silks.

* * *

WATER keeps the oil industry alive; it takes 23 gallons to refine one gallon of oil. This is one of the facts revealed in Water for Oil in "The Lamp" (Vol. 32, No. 1), published by the Standard Oil Company (New Jersey).

AMPOULES and test-tubes of neutral glass for laboratory, medical and scientific purposes made to the highest specifications are being produced by Laborglass (Pty.), Ltd., Johannesburg. It is hoped as the raw material position improves that a large percentage of local needs will be met.

OVERSEAS CHEMISTRY AND INDUSTRY

INDUSTRY IN ISRAEL

British and American Participation in the New Economy

by H. REIK, M.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E.

ISRAEL'S position halfway on the Mediterranean coast line between Turkey and Egypt makes it an ideal centre for the supply and distribution of industrial products to the neighbouring Arab countries, which in turn would be the natural suppliers of agricultural goods and raw materials. That this is not the case at the moment is due to the fact that no final peace treaty has yet been signed. Israel's harbours, the deep sea harbour of Haifa and the two harbours of Tel Aviv and Jaffa, are, however, working to capacity on the territory's imports and exports. The former total about £85 million per annum and the official policy is to reduce the amount of finished products imported by increasing the industrial potential of the country.

OIL AND CHEMICALS

THE agreement to provide sufficient crude oil by shipment to permit operation of the Haifa oil refinery—closed since Egypt forbade the passage of tankers for Haifa through the Suez Canal—marks an important stage of the industrial development of the new State of Israel. An impression of the determined attempts now being made to build up Israel's capacity as a producer and exporter, especially of chemicals and associated products, is conveyed in a series of short articles, based on first-hand observation in Israel, of which this is the first. The second article will deal with prospects of chemical industries and the substantial support which may come from the work of the Weizman Research Institute.

Planning New Industries

The present Jewish population of Israel approaches the 1.1 million mark, with an Arab minority of about 150,000. The Jewish population at the time of the proclamation of the State of Israel (May 15, 1948) was about 670,000. It has thus grown by 65 per cent due to large scale immigration. Work for over 400,000 has to be found, while tackling all the questions concerned with setting up an independent state. The young state recognised quickly that the only way of absorbing such numbers was by planning and encouraging new industries and at the same time assisting existing firms to enlarge their plants and workshops and modernise their methods.

Over 300,000 immigrants have by now been absorbed in the Israel economy, with 80,000 remaining in immigration camps. These are now being transferred to new centres of industry, and citrus areas, and it is expected that the immigration camp population figure will be halved within the next few months.

The Institution of Engineers and Architects in Tel Aviv, which includes all engineers, has set up a separate production and efficiency department which co-operates with corresponding Government bodies, as well as the industrial efficiency department of the Manufacturers' Association, the Israel counterpart of the FBI. This department of the Institute of Engineers has just published its first report on conditions in industry. It criticises severely the tendency of manufacturers to let things stay as they are and to rely on the sellers' market—a state similar to that in England shortly after the war.

The report points out that Israel's industry must become competitive in the world's markets and reduce its production costs by improved methods and machinery. Israel will have to export to balance its payments in the not too distant future and buyers will expect competitive prices. The introduction of time and motion study and incentive systems is recommended.

The Government, a coalition between Labour and Liberal/Conservative parties, has asked for the co-operation of the Manufacturers' Association and the powerful Israel TUC (Histadruth) which embraces both Arab and Jewish workers. The Histadruth differs from the British TUC in that it has its own undertakings like Nesher, the large and modern cement works; Phoenicia, the largest glass plant in the country; Shemen, the vegetable oil works; foundries, and many others, and it is also the largest building contractor in the country. It runs its own health scheme, embracing nearly 60 per cent of Israel's population.

Trade Union Enterprise

One has here the interesting idea of a trade union employing its own members in industrial enterprises. This makes the Government's task easier as the union is

willing and eager to improve production methods, accepts time and motion study and co-operates in questions of industrial relations.

The Government has allocated a large part of the $100 million loan to the acquisition of new plant and machinery. Up-to-date mechanical handling methods are being introduced, conveyors, platform and fork-lift trucks being employed wherever necessary. The harbour authorities in Haifa and Tel Aviv lead the way by introducing large numbers of fork-lift trucks and travelling cranes. Haifa harbour has now over 60 of these trucks, which is a large number even compared with the best British practice.

Technicians and Finance

The level of engineering knowledge and technical skill of the worker in Israel is nearing Continental standards, although many of the new immigrants still need a thorough technical training. A number of trade schools are available, but they cannot cope with the demand and new schools are being opened which, in conjunction with the technical high school in Haifa, will provide the technical personnel for the many new enterprises.

All this expansion depends to a large extent on the investment of foreign capital. American and Continental firms are making use of the special legislation which has been passed in order to facilitate such investments. It is rather strange to see British firms lagging behind in this as they had been a very strong influence on the economic life of the country during the time of the mandate. There are many Israeli firms which would be interested in co-operating with British investors by providing buildings and working capital for extension or new enterprises, while receiving machinery and some raw materials as well as the technical information from the British partner.

In the meantime, American equipment and methods are being introduced, although it is often doubtful whether they are always suited to local conditions. This "American preference" is due to the American loan which specified which equipment should be purchased. British firms have often been disappointed because no sterling releases have been forthcoming for the export of their goods to Israel.

One prominent reason for this dearth of currencies is the fact that Israel's biggest dollar and sterling earner, the huge Haifa refineries, have been standing idle. The direct pipe-line with Iraq has been empty for over two years and only a maintenance staff at the refineries kept the plant in working order. The large generating station has acted as a standby to the Israel grid.

If the refineries are given the crude oil needed, Israel will be able to pay for its oil consumption from the proceeds of the refinery and still keep a surplus of sterling for purchases from Britain. Britain would have millions of dollars. It is very much in the interest of both countries and the

[By courtesy of Anglo-Iranian Oil Co., Ltd.

General view of Haifa Refinery

Middle East that these refineries should work at full capacity.

Israel's main export is still citrus fruit, of which Britain is the main buyer, and our trade and relations with Israel should improve as soon as these difficulties are removed.

The following is a summary of the provisions framed to encourage capital investments in Israel:—

An investment centre has been set up which furnishes information for intending investors and examines proposals for investment from the viewpoint of Israel economy. It can approve of the investment and maintain contact between investors and Government offices in all matters connected with capital investment. Approved investments or undertakings are exempted from urban and rural property taxes for five years. They will enjoy special rates of depreciation on buildings, machinery and equipment.

The ceiling on income tax rates for the first five years will be 25 per cent and the Minister of Finance may, in special cases, refund to a company part of the income tax paid. The import of machinery, plant and raw materials necessary for the enterprise will be given special consideration. Relief from company registration and land transfer fees is granted.

Where a non-resident makes an approved investment in foreign currency, the Minister of Finance may grant him permission to transmit up to 10 per cent of the invested capital per annum in his own currency on account of capital, profit, interest or depreciation of the investment. Where a non-resident goes to settle in Israel, the Minister of Finance may exempt for a period of seven years from the obligation of offering foreign currency to the Ministry of Finance.

The following goods can be exempted from import duty if needed for an approved undertaking: Plant; installations; machinery; pre-fabricated structures and houses for industrial undertakings or warehouses; raw material; building materials; and semi-manufactured goods of a kind not made in Israel.

Chilean Nitrate Prices Raised

AN increase in price of both industrial and agricultural Chilean nitrate of soda was announced on July 1 by the Nitrate Corporation of Chile, Ltd.

Industrial sodium nitrate, 97-98 per cent, crystal and granulated, in 6-ton lots, delivered in Great Britain was raised from £20 10s. to £23 per ton (2240 lb. gross). Additional surcharges on smaller lots will be made as follows: four tons and over, but less than six, 2s. 6d. a ton; two tons and over, but less than four, 5s. a ton; one ton and over, but less than two, 10s. a ton; two cwt. and over, but less than one ton, 20s. a ton.

Prices of agricultural sodium nitrate crystal and granulated, in 6-ton lots, delivered (c.i.f., main ports Isle of Man), was increased from £11 to £19 17s. 6d. a ton gross weight. Additional charges for smaller quantities are the same as those on industrial brands.

U.S. Sulphur

According to the U.S. Bureau of Mines, the domestic sulphur industry produced 389,305 long tons of native sulphur during April. Mine shipments of 497,770 long tons approached the record figures of November 1946, while apparent sales were estimated at 492,538 long tons, the largest for a single month. Producers' stocks continued to decline, and at the end of April were 2,885,294 long tons.

Gas Kills Eleven

GAS, escaping from a furnace at the Consett Iron Company's works on the night of July 1, killed 11 men, and incapacitated 34 others, who were removed to the Shotley Bridge hospital. Six were allowed to go home after treatment, but the remaining 28 were detained.

It was stated by a company official that such gas had approximately the same specific gravity as air, and had no smell, and it was possible that the men were not aware of its presence until they were overcome. The escape occurred just after a new shift had started and the men were affected in a few minutes. According to a time-keeper, there were only five men working in the foundry loading bay. His opinion was that most of those killed were, in fact, trying to rescue others.

Two men were found dead in a kiln at a Middlesbro' ironworks on June 28. It is believed that the men, who were not employed at the works, were overcome by gas while sleeping in the kiln.

German Refinery to be Expanded

A cracking unit is being installed at the Heide (Schleswig-Holstein) refinery plant of the Deutsche Erdoel A.G. at a cost of about Dm.15 million. Motor fuel output of the works is to be stepped up to 180,000 tons p.a., and some 60,000 tons of diesel oil are also to be manufactured annually.

The Chemist's Bookshelf

JOURNAL OF THE ELECTRODEPOSITORS' TECHNICAL SOCIETY. Volume 24, 1948-49. London: Published by the society at 27 Islington High Street, N.1 Pp. 282, 8vo; 2 gns.

There can be few technical societies of top rank, such as the ETS undoubtedly is, in which management expenses are so low and efficiency so high. Salaries and clerical assistance amount to £319 10s. 3d. It is evident that there must be a great deal of very able honorary work by members of council and committees, and keen and zealous co-operation by everyone concerned. This is reflected in a net increase in membership for the last year of 113, bringing the total to about 1000, and the society's generally healthy condition.

The papers in the present volume, already issued in separate form, maintain the high standard set by their predecessors, are eminently practical and are based both on wide experience and on scientific research. In most cases they have evoked keen and informative discussions. As noted in a previous review, it is not apparently possible to print discussions in their proper place at the end of relevant papers. They are mostly lumped together at the end, each with a reference to the pages of the paper discussed. It might be well also to have a reference at the end of the paper to the discussion page. A wide range of interesting subjects is covered, including two papers on barrel polishing, a process still lively and progressive and holding its own very well.

A somewhat ancient technique, but also vigorous and progressive, is that of phosphating, on which H. A. Holden (Pyrene Co., Ltd.) contributes a valuable report of recent progress. Although phosphating has been the subject of innumerable papers in the technical Press and of many patents throughout the world in the last decade or two, this is the first time in five years that it has come before the ETS. The report contains some account of new solutions and also the application of phosphating to lubrication and cold-working on which much interesting work continues. New solutions and methods include some that can be used for aluminium as well as zinc and steel. At the time the paper was presented, patents were pending for some of these—apparently improved Bonderising methods—(*see also* Gibson *et al.*, *Ind. Eng. Chem.*, 1946, 38 (12), 1222-7).

The paper by Dr. S. Wernick and co-workers on blistering of electrodeposits on zinc alloy die castings deals with one of the most persistent and troublesome problems in plating these die castings. It is illustrated by a remarkable series of microphotographs showing different forms of corrosion and blisters. On the subject of corrosion, too, another valuable and practical paper is that of V. Evans on tank linings and insulating materials. Synthetic resin linings, especially PVC, polythene and Perspex, continue to be of promising interest, and indeed have got beyond the promising and reached the accomplished stage. There is, however, always room for further improvement and wider application.

Other papers include two on polishing, and several on general plating, chemical colouring, l.t. power supply, welding, etc., of coated metals, and oxide coatings on aluminium. This is certainly a valuable compendium, but the price of two guineas to non-members may prohibit its fullest distribution.

European Steel and Coal

THE facts bearing upon the need of some form of co-operation for economic co-ordination of the European steel and coal industries are surveyed in the "Monthly Statistical Bulletin" (Vol. 25, No. 5) of the British Iron and Steel Federation. The report shows in detail the extent to which some countries are over-supplied either with iron ore or coking coal and confirms that no European country is independent of outside supplies of both. Outstanding is the dependence of France on imported coal and of Germany and the U.K. on foreign iron ore. Among smaller countries the deficiencies are proportionately greater, Belgium, the Netherlands and the Saar having no iron ore, while Luxembourg, Italy and Sweden have no coal.

OVERSEAS

Protection for Vegetable Crops

A report from a Goodrich subsidiary company at Cleveland claims the development of a new chemical which, applied to vegetable crops, will ward off attacks by rabbits and rodents.

New Argentine Oil Deposit

A prolific new oil deposit, yielding about 150,000 litres of crude oil per day, is reported to have been discovered by the Argentine State Oil Company Y.P.F. at Punta Piedras in the oil region of Como doro Rivadavia at a depth of 2307 metres.

W. German Fat Research

A new institute for fat research has been established in Münster (British zone). Its main activities will be to investigate the utilisation of fats and to examine manufacturing methods. It replaces the former Reichsinstitut which was closed in 1945.

French Steel Pipes for Mexico

The Mexican Foreign Trade Bank is reported to have concluded an agreement with the French Government for the delivery of steel pipes, required for the Tehuantepec pipe-line, valued at one million dollars. Delivery is to be effected within about two months.

Spain Producing Esparto Wax

At the recent Valencia Sample Fair was shown a new wax made from esparto grass for which properties similar to those of carnauba and candelilla waxes are claimed. It is said to be hard and suitable for use in the manufacture of carbon paper, polishes, cosmetics, leather dressings, etc.

Jugoslav Penicillin

The Jugoslav Public Health Council has completed tests of home produced penicillin which are reported to have been satisfactory. Large-scale production is to begin at once. A laboratory has been equipped also for the manufacture of urotropin by the Belishche Timber Processing Combine, near Osijek.

Recovery of Cassella Dyeworks

The volume of output of the 80-year old Cassella Dyeworks, at Mainkur, Frankfort a/M., Germany—a leading unit of the former I.G. Farbenindustrie—is reported to have almost reached its pre-war level. Over a third of the total sales is being exported, and about 100 new items have been included since the war in the company's manufacturing programme which gives employment to more than 1550.

Test Drilling in Jugoslavia

Reports from Jugoslavia state that drilling for oil is planned in the Ulcinj region on the coast of Montenegro. It is hoped that total output will reach 400,000 metric tons in 1951.

Sterilisation by Electrons

It is reported from the U.S.A. that antibiotics, such as penicillin and streptomycin, are being sterilised by electron bombardment from a 2 million volt atom accelerator.

Marshall Aid Cargoes

Included in recent cargoes shipped to the United Kingdom under Marshall Aid auspices were: carbon black, 2803 tons; steel, 403 tons; aluminium, 3783 tons; copper, 1570 tons; zinc, 1000 tons.

New Rust Inhibitors

Two new rust inhibiting white lead pigments, non-reactive toward vehicles containing free carboxyl groups, have been introduced for the paint and varnish industry by the Monsanto Chemical Company, St. Louis, Missouri. It is producing commercial quantities of trilead orthophosphate and dilead pyrophosphate. They are said to be among the few rust inhibitors which do not react with solution coatings composed of a polyvinyl chloride-acetate copolymer modified with a dicarboxylic acid.

Industrial Casualties

DEATHS from industrial accidents reported in May showed a decrease both from the previous month and from the same period last year. The total in May was 103 against the revised figures for April of 114 and May, 1949, of 167.

There were only four deaths in chemicals, oils, soaps, etc.; metal extracting and refining accounted for three, and metal conversion and founding for nine; there were five in gas works and one each in textile manufacture and textile printing, bleaching and dyeing.

Industrial diseases reported in May under the Factories Act, 1937, or under the Lead Paint (Protection against Poisoning) Act, 1926, showed only one death; this was in the oil industry due to skin cancer (epitheliomatous ulceration). The number of cases reported totalled 41, of which 18 were ascribed to skin cancer (pitch, 12; tar, 4; oil, 2).

HOME

Coal Production

Production of deep-mined coal last week increased by 42,300 tons over the previous week. Comparing figures are:—Last week: 4,305,700 tons (deep-mined 4,031,700 tons, opencast 274,000 tons). Previous week: 4,271,400 tons (deep-mined 3,989,400 tons, opencast 282,000 tons).

£100,000 for Research Fund

Appreciation of the dependence of industrial development upon research is evinced in the report of the directors of Bakelite, Ltd., in which it is mentioned that a new reserve was set up by the company in 1949, the "scientific research reserve," to which £100,000 has been transferred from the general reserve.

Imports from Belgium and Luxemburg

Licences for the import of goods from the Belgo-Luxemburg Economic Union will continue to be issued by the Board of Trade on the scale which has been operating under the arrangements reached in February with the Belgian and Luxemburg authorities for the period ended June 30. Financial arrangements are also being continued for the time being on the present basis.

Oils and Fats

The Ministry of Food announces that no change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the five week period ending August 5. The Ministry states that its stocks of castor oil are now exhausted and the published prices of £115 per ton for "firsts" and £108 per ton for "seconds" are therefore withdrawn. The Ministry is offering hardened whale oil No. 3, 40/42°, at £100 per ton naked ex works.

U.K. Copper Prices

No increase in price of U.K. copper will be made at present despite the rise in the U.S. domestic price following the reimposition of American import duty on July 1. This decision was announced by the Ministry of Supply after discussions with Rhodesian producers, who stated that they did not wish to take advantage in their pricing arrangements of any increase due to the American duty. Further discussions will take place as soon as an assessment can be made of the effect the duty has had on American prices.

Explosion Inquest Postponed

The inquest on the two victims of the explosion at Monsanto Chemical Works, Cefn Mawr, on June 26, was opened at Wrexham, on June 28 and adjourned provisionally until September 6. The coroner's expression of sympathy with the relatives was endorsed by Dr. W. D. Scott (deputy managing director of the Monsanto Company).

Transport's Influence on Materials Costs

A further indication of the effect of recent increases in rail and road transport charges on the cost of materials is provided by the new prices notified by Widnes Foundry & Engineering Co., Ltd. The selling prices of Class A castings have been increased by 9d. per cwt. as from July 1. Special low phosphorus and acid resisting castings will be subject to special increases.

Mechanical Engineers Visit G.E.C.

Members of the Institution of Mechanical Engineers, during their recent summer meeting at Birmingham, visited the Witton works of the General Electric Co., Ltd. During the tour the visitors also saw the high power testing station and inspected the 75,000 k.V.a. transformers and hydrogen-cooled alternators being constructed for Uskmouth Power Station.

Chemical Employment

Numbers employed in the chemical and allied trades in April remained steady, (in thousands) 444.0 compared with 443.7 in March. Analysis of these figures in the *Ministry of Labour Gazette* showed the following distribution: coke ovens and by-products 17.1; chemicals and dyes 202.8; pharmaceuticals, etc., 34.0; explosives, etc., 36.9; paint and varnish 38.3; soaps, glycerin, etc., 48.0; mineral oil refining 36.2; oils, greases, glues, etc., 30.7.

Synthetic Detergents

Reporting increased sales of synthetic detergents in 1949, Lever Bros. and Unilever, Ltd., observes that its development of this work was hampered to some extent by shortage of some chemicals and unsuitable quality of some other materials, except from dollar sources. The annual report notes that "the ultimate level of acceptance of synthetic detergents remains to be determined; only when adequate supplies both of soap and synthetic products are available will the housewife be able to make up her mind on the basis of price and effectiveness."

PARLIAMENTARY TOPICS

QUESTIONED about the achievements of the Hydraulics Research Organisation since its inception four years ago, Mr. Herbert Morrison, Lord President of the Council, said that marked advances in instrumentation had been made. These included methods for the continuous measurement of velocities in sea and streams and the development of a pneumatic tide generator which could reproduce any desired tidal conditions. Basic problems under investigation include: characteristics of natural water channels, problems of coast erosion and the behaviour of channels in estuaries.

NEED for greater care in the handling of DNOC when applied as a spray for grain crops was again emphasised in the House of Commons. In a written answer, Mr. T. Williams, Minister of Agriculture, said that precautions for the use of DNOC and similar substances had been given wide publicity by his department. A new leaflet was in preparation, and investigation was in progress with the interests concerned as to any further steps which might be necessary.

MR. HECTOR McNEIL, Secretary of State for Scotland, said he was considering whether further legislation was needed to deal with the emission of fluorine fumes by factories in Scotland. He was replying to several questions, in the course of one of which Lord Malcolm Douglas-Hamilton alleged that there were harmful discharges which required fresh legislation and there was not the same protection as the law afforded in England.

Personal

SIR IAN HEILBRON, chairman of the Advisory Council of Scientific and Industrial Research, has been elected a foreign member of the Royal Netherlands Academy of Sciences and Letters.

COMMANDER J. H. F. KENT, R.N.(Retd.), has been re-elected president of the Retread Manufacturers' Association for 1950/51. Mr. Ronald H. Pike, chairman of the technical advisory committee which drew up the association's code of minimum standards for retreading, has been re-elected vice-chairman.

The National Coal Board has appointed LORD ADAMS and MR. WILLIAM HODGSON to be part-time directors of the Northern (N & C) divisional board, which administers the coalfields of Northumberland and Cumberland.

WINTER ELECTRICITY

THE Electricity Sub-committee has decided that load-spreading arrangements applicable to industries will again be necessary this coming winter, but to a lesser extent than in previous years. It is considered that the position has so improved that the morning peak hours will be confined to the period 8—9.30 a.m., though care will be necessary up to noon, and during December, January and February reduction in load of at least 10 per cent will be needed. The afternoon peak hours remain unchanged at 4—5.30 p.m., when a reduction of 10 per cent will be required from December to mid-January. Where local circumstances make it necessary, the Regional Boards will have discretion to require a reduction in load of more than 10 per cent. The estimates of consumption next winter are based upon the maximum demand which would have been made last winter had there been no reduction then by load spreading.

New Food Labelling Regulations

A NUMBER of changes have been made by the Ministry of Food in the Labelling of Food Order, 1950, which comes into force on November 1. The principal change in the new order, which re-enacts the Labelling of Food Order, 1946, is the omission of the weights and measures regulations.

Among the more important provisions are these:

Liquors for which tonic, restorative or medicinal properties are claimed, or which are held out to be of special benefit to invalids, must be labelled with a statement indicating the quantity of the ingredients on which the claim is based.

Concentrated acetic acid must comply with certain special labelling requirements.

Tonic properties may not be claimed for any food on the sole grounds that the food contains (a) alcohol, (b) sugars or other carbohydrates, (c) protein or substances prepared by hydrolysis of protein or (d) caffeine or other purine derivatives.

Sharing Technical Knowledge

The successful exhibition of its technical literature, "I.C.I. as Publisher" first seen in London, was opened by Imperial Chemical Industries, Ltd., in Glasgow recently. The Lord Provost, M. Victor Warren, speaking at the opening, referred to the company's vast output of technical literature and its willingness to make available the results of its research.

The Stock and Chemical Markets

BUSINESS in stock markets has remained on a restricted scale owing to the general tendency to await developments in Korea. There has been no heavy selling, apart from the gold mining and other speculative sections, which have reacted sharply again. British Funds were lower on balance, largely because they were a rising market prior to the Korean news, and there has since been a good deal of profit-taking by financial institutions. This week sentiment in the Gilt-edged market has had the benefit of news of the increase in the gold and dollar reserve figures, but £37.5 million had to be found for the 25 per cent instalment in respect of the £150 million British Electricity 3½ per cent loan.

Most chemical and allied shares have kept steady, movements generally not exceeding more than a few pence. Imperial Chemical eased to 40s. at one time, but have since firmed up to 40s. 6d. Monsanto held up well again at 49s. 6d. and Brotherton 10s. shares were well maintained at 20s. Laporte Chemicals 5s. ordinary were at 9s. 9d. again, at which there is a yield of 4½ per cent on the basis of the 8¾ per cent dividend. This represented a very conservative payment, because earnings on the shares were fully 26 per cent.

Albright & Wilson 5s. ordinary were steady at 28s. 6d., F. W. Berk 2s. 6d. shares were at 15s. 6d. and Boake Roberts 5s. at 26s. Bowman 4s. ordinary were 5s. 3d., Pest Control 5s. shares 7s. 9d. and Fisons steady at 26s. British Glues & Chemicals 4s. shares showed firmness at 21s. 9d., the market expecting the financial results to create a good impression. Borax Consolidated were firm at 55s. 6d. but Turner & Newall eased to 81s. 6d.

Lever & Unilever, at 41s. 3d., remained under the influence of the good financial results, and Lever N.V. were 39s. British Aluminium at 39s. 6d. held up quite well and United Glass Bottle (75s.) continued to hold their recent improvement. There was a fair amount of activity around 23s. in Triplex Glass, awaiting the financial results. United Molasses came back to 42s. 3d. and Glaxo Laboratories to 47s. 9d. British Oxygen at 96s. 9d. have been quite well maintained.

Shares of companies connected with plastics were inclined to ease. De La Rue 5s. ordinary were 28s., at which there is a yield of over 10½ per cent on the basis of last year's 50 per cent dividend. British Xylonite were 75s. and British Industrial Plastics 2s. shares 6s. 9d., at which there is a yield of 6¾ per cent based on last year's 20 per cent dividend.

There were small declines in iron and steel shares earlier in the week, awaiting the results of John Summers' £5 million debenture issue. It is pointed out in the market that at current levels iron and steel shares offer attractive yields, and that there are good prospects of dividends being maintained. Moreover, if after all steel were nationalised, shareholders would have more than current market prices for their shares, bearing in mind that take-over prices already fixed are well in excess of current levels. United Steel, for instance, are now changing hands around 25s. 6d. in the market and their take-over valuation is 30s. 4d.

Boots Drug at 46s. 6d. strengthened because of the good impression created by the financial results and the strong balance-sheet position. British Drug 5s. shares at 7s. 6d. have been steady, but Beechams deferred eased to 12s. 6d. Oil shares were lower on balance, Anglo-Iranian being ¼ down at 6⅝ on terms of the new concession agreement with Iran. Shell also eased and Ultramar Oil came back to 12s. 6d.

Market Reports

THERE has been no outstanding feature in the industrial chemicals market during the past week, the demand both for home and export continuing fairly steady. Contract delivery specifications are well up to schedule and there is an increasing interest in new forward business. Quotations generally remain unchanged and the undertone is firm. An exception is the lead compounds, which have been further reduced with the decline in the price of the metal. The convention basis price for red lead is now £107 per ton and for white lead £116 10s. per ton. Rather more active conditions are reported in the coal tar products market, with pitch and creosote oil in good call. Prices are steady at recent levels.

MANCHESTER.—Trading conditions on the Manchester chemical market continue under seasonal holiday influences, which have made themselves felt both in the aggregate weight of chemicals taken up against contracts and in the volume of new business. The market otherwise has been fairly active, with delivery specifica-

(continued on next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AFFINED BASIC CHEMICALS, LTD., London, W. (M., 8/7/50.) June 8, £22,000 mort., to Legal and General Assce. Soc., Ltd.; charged on land and factory premises at Newland Meadow and land and factory premises at Newland known as Empire Works, both High Wycombe. *Nil. Dec. 8, 1949.

Increases of Capital

The following increases in registered capital have been announced: Chemical & Carbon Products, Ltd., from £1000 to £10,000; M. V. A. Laboratories, Ltd., from £5000 to £20,000; Epsylon Research & Development Co., Ltd., from £100 to £20,100.

Change of Name

The name of Unifloc Reagents, Ltd., 2/3 St. Mary Street, Swansea, has been changed to Unifloc, Ltd.

Company News

Amber Chemical Industries, Ltd.

Net profit of Amber Chemical Industries, Ltd., for the year was £19,552 and the balance after allowance for taxation £13,845. The interim and final dividend (each 5 per cent) on ordinary shares is £4950, leaving a balance carried forward of £6145.

A.P.V. Co., Ltd.

Net profit of the A.P.V. Co., Ltd., for the year ending December 31, 1949, was £296,363, compared with £270,898 for the previous year. A final dividend of 8d. per share on ordinary share capital was recommended, following an interim dividend of 4d. a share. At a subsequent extraordinary general meeting resolutions were passed providing that the capital of the company be increased to £1,650,000 by the creation of 11,750,000 ordinary shares of 2s. each; that £288,552 of the undivided profits be capitalised and distributed among shareholders by paying up in full at par 2,885,520 ordinary shares (four for every existing share held).

Coalite and Chemical Products, Ltd.

Net profits, for year ended March 31, of Coalite and Chemical Products, Ltd., were £136,243, compared with £138,472 last year. A final dividend of 3 per cent on the ordinary shares has been recommended, making, with the interim dividend of 3 per cent already paid, a total dividend for the year of 6 per cent (same).

Bakelite, Ltd.

Net profit for 1949 of Bakelite, Ltd., was £220,366, compared with £202,348 in 1948. A final dividend of 13 per cent, making, with the interim dividend already paid, a total of 18 per cent for the year, has been recommended. This is the same as in 1948.

The Bleachers' Association, Ltd.

Net profit of the Bleachers' Association, Ltd., for the year ending March 31, was £364,117 (£297,763). A jubilee bonus of $2\frac{1}{2}$ per cent (£26,254) was added to the ordinary 5 per cent dividend (£52,508), and an award of £25,000 was made to the staff.

Forster's Glass Company, Ltd.

Net profit of Forster's Glass Co., Ltd., for the year ending March 31, was £48,000 (£49,100). The ordinary dividend is $16\frac{1}{4}$ per cent (£27,930).

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

tions from the textile and allied industries in the area coming forward freely. Prices generally remain on a firm basis. There has been only a moderate business placed during the past week in the fertiliser market, but as this is the off-season period it is early yet to attempt to estimate the effect of the substantial rise in prices which came into force last Saturday. Most of the tar products are meeting with steady demand.

GLASGOW.—Business generally has improved considerably over the past week. The export market has also shown renewed activity.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Fluorescent material.—British Thomson-Houston Co., Ltd. (General Electric Co.). Jan. 19, 1945. 641,212.

Production of energy through nuclear fission of uranium.—Centre National de la Recherche Scientifique. March 26, 1946. 641,216.

Separation of fatty oil substances.—Texaco Development Corporation. July 11, 1946. 641,220.

Manufacture of modified starch.—National Starch Products, Inc. Aug. 29, 1946. 641,222.

Magnesia insulation and method of manufacturing same.—A. H. Stevens (Johns-Manville Corporation). Nov. 15, 1946. 641,415.

Manufacture of crystalline mixed sulphates.—Communication Engineering Pty., Ltd. March 17, 1947. 641,237.

Manufacture of 8; 8-dichlor-8; 8-diacetodipropyl ether and 4-methyl-5-β-hydroxyethyl-thiazole.—Merck & Co., Inc. April 9, 1947. 641,426.

Electric dry cells.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 10, 1947. 641,427.

Distillation of water.—R. Andersen. April 11, 1947. 641,429.

Fuel agglomerate and its method of manufacture.—A. Vloeberghs. April 12, 1947. 641,166.

Compounds containing a thiophene nucleus and process for the production thereof.—Texaco Development Corporation. April 22, 1947. 641,239.

Cellulose products.—Rayonier, Inc. May 15, 1947. 641,242.

Production of photographic dye images.—Kodak, Ltd., and A. K. Soper. May 21, 1948. 641,355.

Aldonate compositions and method for the production thereof.—Poor & Co. May 28, 1947. 641,435.

Process for handling acetylene safely and employing it with safety in chemical reactions especially in the production of vinyl ethers.—General Aniline & Film Corporation. May 31, 1947. 641,436.

Process for the production of N-vinyl compounds.—General Aniline & Film Corporation. May 31, 1947. 641,437.

Process for the production of vinyl esters of organic acids.—General Aniline & Film Corporation. May 31, 1947. 641,438.

Oil-soluble metal salt compositions and method of making same.—Nuodex Products Co., Inc. June 10, 1947. 641,168.

Process for the manufacture of di-iso-propyl-benzene hydro-peroxides and products resulting therefrom.—Distillers Co., Ltd., E. G. E. Hawkins, D. C. Quin, and F. E. Salt. June 24, 1948. 641,250.

Method for the production of basic substances for ion exchangers.—Norsk Hydro-elektrisk Kvaelstofaktieselskab. July 4, 1947. 641,173.

Wetting agents or detergents.—Standard Oil Development Co. July 8, 1947. 641,439.

Process for the simultaneous production of algin, alginates, iodic salts of algae, salts of algae free from iodine and organic iodine utilising seaweeds relating to the group of Phaeophyceae.—Prosolmer Soc. Anon. July 14, 1947. 641,440.

Gas cleaning devices of the cyclone type.—C.U.R.A. Patents, Ltd., and F. F. Ross. Dec. 24, 1948. 641,357.

Polymers and process of producing same.—B. F. Goodrich Co. Aug. 1, 1947. 641,442.

Stabilisation of unsaturated ketones.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 5, 1947. 641,443.

Metalation of halogenated thiophenes.—Socony-Vacuum Oil Co., Inc. Aug. 26, 1947. 641,260.

Catalyst and method of producing same.—Standard Oil Development Co. Sept. 2, 1947. 641,261.

Alpha-cyano-alkyl esters of monocarboxylic acids and process of preparing same.—B. F. Goodrich Co. Sept. 8, 1947. 641,264.

Catalysts for the synthesis of hydrocarbons.—Standard Oil Development Co. Sept. 19, 1947. 641,266.

Alkenyl silane interpolymers.—British Thomson-Houston Co., Ltd. Oct. 13, 1947. 641,268.

Manufacture of refractory substances.—Birmingham Small Arms Co., Ltd., P. H. Lawrence, J. R. Rait and E. Bates. Oct. 16, 1948. 641,187.

Preparation of derivatives of phenthiazine.—Soc. des Usines Chimiques Rhone-Poulenc. Nov. 20, 1947. 641,452.

Processes for use in coating ferrous metal surfaces.—Poor & Co. Nov. 24, 1947. 641,191.

Photographic elements.—E. I. Du Pont de Nemours & Co. Nov. 26, 1947. 641,368.

Preparation of hydroxyl polymer silver halide emulsions.—E. I. Du Pont de Nemours. Nov. 26, 1947. 641,369.

Tertiary amines and methods for obtaining the same.—Parke, Davis & Co. Nov. 27, 1947. 641,454.

Pressure treatment of materials for changing the gas content thereof.—J. A. Johnson. Dec. 6, 1947. 641,375.

Diazotype dry strip film.—General Aniline & Film Corporation. Dec. 8, 1947. 641,273.

Film drying process for the preparation of pulverised or scaly products.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Dec. 10, 1947. 641,455.

Stabilised aryl diazo-n-sulphonate light-sensitive material.—General Aniline & Film Corporation. Dec. 29, 1947. 641,276.

Method of producing molybdenum.—Westinghouse Electric International Co. Jan. 6, 1948. 641,379.

Preparations for use in agriculture and horticulture.—H. van Issum and W. F. Fuhrhop. Jan. 3, 1949. 641,280.

Production of polymeric materials.—Imperial Chemical Industries, Ltd., A. Burness and E. G. Williams. Jan. 19, 1949. 641,284.

Germicidal detergent composition.—General Aniline & Film Corporation. Feb. 20, 1948. 641,297.

Coloured cellulose ester or ether textile materials.—H. C. Olpin and W. B. Miller. Feb. 21, 1949. 641,459.

Apparatus used in contact with molten glass.—Mond Nickel Co., Ltd., and E. C. Rhodes. Feb. 21, 1949. 641,299.

Preparation of amalgams.—H. G. C. Fairweather (Guldsmeds Aktiebolaget i Stockholm, G. A. B.). Feb. 23, 1948. 641,300.

Solid, glass-like polymers.—Imperial Chemical Industries, Ltd., E. R. H. Jones, M. C. Whiting, H. P. W. Huggill, and D. B. Kelly. March 7, 1949. 641,310.

Coating of solid particles with liquid.—Foster, Yates, & Thom, Ltd., and H. Dowell. April 23, 1949. 641,317.

Compositions comprising an oil phase and an aqueous phase.—Lever Bros. & Unilever, Ltd. May 11, 1948. 641,203.

Production of polymeric esters.—Courtaulds, Ltd., F. Reeder and E. R. Wallsgrove. May 11, 1949. 641,320.

After-treatment for diazotype prints.—General Aniline & Film Corporation. May 25, 1948. 641,323.

Process for the production of moulded catalysts.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 6, 1948. 641,332.

Moulded catalysts.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 7, 1948. 641,333.

Photographic developer containing a negatively substituted aralkylamine and process of development.—General Aniline & Film Corporation. Aug. 21, 1948. 641,405.

Process for the treatment of magnesium and its alloys.—Regie Nationale des Usines Renault. July 29 1946. 641,544.

Preparation of melamine.—American Cyanamid Co. Aug. 28 1946. 641,643.

The Chemical Age

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Operational Research

IS it new? In what way is it new? Is it scientific? These are the three questions which, according to Professor P. M. S. Blackett, F.R.S., require to be asked when the subject of discussion is operational research. Many with a fairly wide acquaintance with research programmes of one sort or another might excusably preface those questions with another: What is operational research? The facts that during the constructive period of the war—constructive from the Allied viewpoint—the production of munitions of all sorts and the conduct of many kinds of warlike activity were the subject of detailed scientific and statistical study by experts not themselves engaged in the particular operations, and that this work often produced almost startlingly effective modifications, have not yet established operational research on an accepted conventional footing. Operational research is in most industries still a novelty, often an untried one, and the present urgent need to improve production efficiency and effect economies has provided the stimulus for an outstanding example of exposition which goes far towards answering the question. The sponsors were representatives of Manchester University and the Manchester Chamber of Commerce who combine to form the enterprising Manchester Joint Research Council. The council had many authoritative helpers in the five lectures and subsequent discussions at which operational research was studied in the round and in detail, and the new publication* in which all these facts and opinions are stated may form a reference work of permanent value.

Professor Blackett, whose penetrating summary of what operational research is and what it can achieve prefaces the studies by five experts from different branches of industry and the equally revealing discussions, has supplied the most economical definition. "Operational research is the scientific method of providing executives with the numerical basis for decisions." That necessarily does not convey all the many potential recommendations for making almost any large-scale industry the subject of statistical review by specialists. That work is done on the factory floor, as well as in the ledgers, and the viewers are exempt from the many distractions which beset those who operate the process in its wealth of detail. On those terms this form of research was shown—by much of the evidence adduced by the Manchester forum—"to have produced the same dynamic

* "Operational Research Its Application to Peacetime Industry," published by the Manchester Joint Research Council; 10s 6d.

On Other Pages

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effects, in a relative sense, in the smaller spheres involved as the great scientific discoveries have had for the world at large." Those are the words of the chairman of the Manchester council, Sir Raymond Streat, C.B.E., who is one of the last people to be suspected of overstating the case for operational research or any other prospect.

The starting points of the Manchester discussions were full-length studies of methods and results of bringing scientific and statistical standards to bear on the day-to-day operations of five large industries—boots and shoes, the National Coal Board, cotton, steel and road transport. All were shown to have derived important improvements of efficiency and economy from what one of the exponents (Dr. W. H. Glanville, director of road research) described as "taking the scientist out of his laboratory . . . and letting him see and advise on the wide practice of running the business." That does not imply, for example, the metamorphosis of chemists into statisticians, but it does demand the intensive objective study and measurement of ordinary activities in accordance with the disciplined principles of the scientist. The doctrine as a whole contains some very obvious pitfalls for those who mistake it as a panacea for production problems at large, without placing operational research in its true proportions. It will not by itself eliminate any workshop problem, and fanatical reliance on this or almost any other statistician's touchstone can obviously produce ludicrous results. At least once the view was seriously advanced that the probable frequency of plant replacement could be determined in advance by some statistical relationships to the number of meals served in the works canteen. That route to Birmingham "by way of Brighton pier" was an American suggestion and clearly has nothing in common with what has been tentatively but encouragingly outlined at Manchester.

The standing of this subject has indirectly been greatly heightened from the plain man's viewpoint by the occasionally striking results gained from the dispassionate observation of ordinary things by the "productivity teams" in the U.S.A. Their aims did not differ substantially from those of operational research.

Notes and Comments

Soap and Synthetics

THE end of soap rationing in September could bring a fundamental change in the conditions of two very large sections of chemical process industry, the making of domestic soap, and of the synthetic detergents whose prominence in the household sphere has been attained largely since the war. Rationing of conventional types of soap has endured only since 1942 and the progress of the synthetic replacements, mostly based upon alcohols, has been little short of phenomenal. Most of it has been more recent than the beginning of rationing, and the rapidity with which the detergents have been adopted for household use has not all been due to the powerful advertising campaigns with which they have been introduced.

Marked Advance

IN their uniformly effective "softening" of water of varying hardness, their capacity for domestic jobs verging upon the industrial kind—such as paint cleaning—and their disposal of greasy precipitates, the soapless powders have represented a marked advance. Opportunities in the development of natural soap, except of special and toilet grades, may well be correspondingly limited, unless some large manufacturers elect to revert to their first-born, to the detriment of detergent research. An illuminating comment is that the detergent manufacturers in the United States—where there has been no soap rationing, and hence less need for soapless substitutes—claim that, of all materials sold for industrial and household cleaning, nearly half are synthetics. There would seem to be little reason to expect that the position in Great Britain will undergo radical change when soap is freed. If some heightened competition from the natural product acts as a spur to research for further improvement of the synthetics the new industry will become more firmly entrenched than ever.

Production Stimulus

OFFICIAL attempts at inculcating "productivity mindedness" have a habit of being as unconvincing as the jargon and slogans with which they are decked. "Productivity in Chemicals" is something so new and so different that it is surprising to note that it bears the stamp of the Government's Economic Information Unit, whose record in this kind of propaganda has not been distinguished. This booklet is a well produced and well illustrated presentation of the facts about United Kingdom chemical industry and about what must follow if output cannot be raised or if costs rise substantially. Most of those facts will not be news to managements, or to those who have read what the chairmen of chemical companies have had to say. Whether these data concerning the bearing of chemical supplies upon employment and general welfare are new or familiar to chemical workers, they have never previously been presented so well in that quarter. The secret of this realism, which is even more marked in the companion booklet, "Speakers' Notes", principally for trades union officials, seems to be that both are the fruit of collaboration between the Government information group and the Chemical and Allied Industries Joint Industrial Council and the Drug and Fine Chemical Joint Conference. The booklets together give a well drawn picture of the place of chemicals in the general scheme and they are the first in which a JIC has taken a hand.

Industrial Nurses

THE active discouragement of recruiting trained nurses into industry was an unwelcome suggestion in a report by a joint sub-committee of medical specialists in Scotland. Responsible for investigating the effect of the National Health Service upon the tuberculosis service in Scotland, the medical people suggest that, because the needs of the tuberculosis

service is so pressing, first-aid workers should be used to a greater extent in industry as a temporary measure, notwithstanding the existence of a legitimate need of nurses in this field. The retrograde character of that suggestion illustrates how critical is the shortage of trained nurses, leading to a situation in which help for one section of the medical services can be had only to the detriment of another. The deserving nature of the objective in this instance—to provide proper treatment, now often lacking, in the early stages of tuberculosis—is the only good excuse that can be advanced for robbing Peter to pay Paul. Good as they are, the first-aid men of most large works are not the equivalent of the hospital trained worker, whose withdrawal would certainly reduce the high standard gradually being attained by industrial health services.

Boiler Feed Water

DURING the past 20 years increasing attention has been given to the chemical treatment of water for boiler feed, and although there is still ample room for closer application of science to this hitherto rather neglected subject, the position has been reached where the menace of scale, corrosion and caustic embrittlement is now recognised as real and actual, and a little light is being shed on the more obscure aspects of this branch of water chemistry. It is important in these days, when all the emphasis is on production, that industrial plant should run with as few hindrances as possible. Full production, however, depends as intimately upon power as it does on continuity of processing, and the conditions under which the power is generated are of corresponding importance. Boiler explosions, of which a tragic instance was the subject of a rather inconclusive inquiry at York last week are, fortunately, rarities. Because the explosion cost a man his life there was no disposition to treat the matter casually. Whether there is any better reason for passing over the milder manifestations of inefficiency of industrial heat raisers is at least doubtful. Simplified methods of water treatment by physical or chemical means have greatly simplified the task of keeping steam and water equipment at least 80 per cent efficient. Yet all the technical aids, advisory service and propaganda have not yet disposed of the phenomenon of the heavily scaled or corroded industrial boiler, working well below the 80 per cent level and liable at any moment to turn saboteur. Its total failure can produce "sympathetic strikes" by other plant when the load on them is raised.

Improved Metal Study

RECENT work of the U.S. National Bureau of Standards chemists derives chemical engineering interest from the fact that a new technique has been developed for the study of plastic deformation in Monel metal. The X-ray diffraction methods formerly used were not particularly successful where minute areas were concerned. The new method is to use polarised light to make visible the differences in orientation that result from the deformation of a fully annealed specimen. Preliminary work suggests that this is more sensitive than X-ray diffraction, and it appears that polarised light might be used to detect preferred orientation resulting from shaping processes, such as rolling and stamping. Since other cubic metals, including copper, aluminium, nickel and *alpha* iron, can be made optically active this new application of polarised light should assist the study of a number of commercial metals.

U.S. Cites British Engineering Firms

FOURTEEN firms have been cited in a civil anti-trust suit filed by the Department of Justice at Pittsburgh as having been associated in an alleged attempt to control the world market in rolling mill equipment. Three British, one Canadian and one Australian firm are included in the list. They are: Davy and United Engineering Co., Ltd., Sheffield; English Steel Corporation, Ltd., Vickers Works, Sheffield; The Darlington Forge, Ltd., Darlington; Dominion Engineering Works, Ltd., Montreal; Broken Hill Proprietary Co., Ltd., Melbourne.

SAFETY IN CHEMICAL INDUSTRIES

Need for International Collaboration

THE need of international collaboration on measures to minimise hazards in the chemical industry was recognised by the inclusion of the subjects of safety and hygiene in the agenda for the second session, at Geneva, of the Chemical Industries Committee of the International Labour Organisation. It was decided to set up a sub-committee on the subjects.

A report prepared by the International Labour Office, now gives a model code for safety regulations in chemical industries and problems of hygiene.

The sub-committee was composed of 30 members, giving equal representation of Government, employers' and workers' interests. Mr. Duguid (Government member, United Kingdom) was elected chairman, with M. Nicaise (employers' member, Belgium), and Mr. Kumar Sen (workers' member, India) as vice-chairmen. The representative of the secretary-general was M. Vaage.

In the course of the long discusssions, Mrs. Beyer (U.S. Government member) explained the reasons for her Government's opposition to the proposed code and suggested that the ILO should collect and distribute information on the technique of accident prevention in different countries; study the question of collaboration between employers and workers; and distribute information on practical means of accident prevention. Other methods of accident prevention were the labelling of harmful materials, education of workers and proper training of factory inspectors.

Marking Dangerous Substances

M. Lafarge (Government member, France) thought the proposed code was unnecessary in view of the recent publication of the General Code. He thought the marking of dangerous substances was very important to protect workers in the chemical industry as well as the users of the products. It would be best for this sub-committee to confine its attention to a few outstanding risks such as those arising from benzene, silica and other forms of dust.

Mr. Hewitson (workers' member, United Kingdom) said that the workers could not agree that a general code was sufficient. Special provision must be made for the chemical industry. He knew it would take a long time to compile. There were some employers who did everything possible for safety and health but there were others who should be compelled to take similar action. It was important to avoid vague texts which led to misunderstandings in interpretation.

He appealed particularly to the representatives of the United Kingdom and the United States to see that the benefits which so many of their workers enjoyed in matters of safety and health were made available to the thousands of workers throughout the world.

ABCM's Rules

Referring to the good conditions in many factories, Mr. Baggs (Employers' member, United Kingdom) said that the Association of British Chemical Manufacturers had produced rules of a kind which the Workers' Group desired. These rules were, however, in general terms and when an attempt had been made to add detailed provisions to these rules the task was found to be superhuman. The difficulties encountered by the ILO in preparing drafts for this meeting were well understood. The existing code covered many of the risks of the chemical industry. It would, however, not be difficult to agree and to record the broad general principles of safety and hygiene.

It was finally decided that a further study should be made of means of accident prevention and health protection in the chemical industries. The ILO was therefore asked to make any amendments and improvements to the model code it might consider necessary and submit them to the third session of the Chemical Industries Committee.

Regarding classification and labelling, the ILO was invited:—

(a) to study the possibility of drawing up a classification of chemical products which should be considered as: dangerous and obnoxious; and toxic;

(b) to draw up the indications which should be reproduced on the labels attached to containers to warn users of the dangerous or toxic characteristics;

(c) to study the possibility of establishing an international mark of protection, to be affixed to the containers of all dangerous, obnoxious and toxic substances, such international mark of protection to be the subject of an international labour convention.

Questions concerning the organisation of

working hours in the chemical industries also came under critical review based on consideration of the ILO report. While some proposals submitted by the workers' group were not accepted, the following items were adopted:

Since conditions in the chemical industry with respect to unhealthy and dirty work vary, in calculating normal hours of work arrangements for changing clothes and washing must be the subject matters for normal negotiating procedure of individual negotiations in each member state.

In semi-continuous or continuous processes where there are three continuous shifts or where work is otherwise continuous, there should be a short break, without loss of paid time, to enable each worker to take a meal. It was also recognised as desirable that the average weekly hours worked by shift workers should be as nearly equal as practicable with those worked by day workers.

Organisation of shift working should be arranged as far as possible in consultation with the workers concerned, and shifts should be periodically rotated. Wherever practicable, each worker should be enabled periodically to take his rest period at night; to have at least one weekly period of rest of 24 consecutive hours, and to have his weekly rest period as frequently as practicable on the normal day of rest.

Where the work is dangerous or unhealthy the organisation of working hours, including time required for putting on and taking off special protective equipment in those occupations, should be directly related to the risk or hazard and should be the concern of both employers and workers. Such matters should be covered either by national legislation or through normal negotiating procedure.

Systems of fixing normal hours of work and overtime were considered, and it was suggested that overtime should be paid after the completion of such normal number of hours of work per day or per week as might be determined through the regular negotiating procedure in the respective member states. It was also recognised that the working of systematic overtime was undesirable.

The ILO was invited to undertake a comparative study of day work and shift work in the chemical industries.

The importance of a carefully and systematically trained labour force for the development of the chemical industry was considered. The ILO was requested to continue its inquiry into the necessity for improving and extending systems of vocational training and to submit its findings to the third session of the Chemical Industries Committee.

Jury Criticises Inadequate Firefighting Equipment

CRITICISM of an Ironbridge (Shropshire) metal works at which two people were killed by an explosion on May 12, was made in riders which the jury added to their verdict of "Accidental death" at the inquest on July 5. They said the premises were unsuitable for the work carried on, and that adequate firefighting appliances had not been available.

The inquest was on the managing director of the factory, Mr. Ferdinand Frankel, aged 57, of Wellington, a naturalised Bavarian, and an employee, Mrs. Kate Healey.

Evidence was given by some of the eleven injured firemen and employees that when a small fire broke out near the furnace it was smothered with foam but broke out again after a minor explosion. Divisional Fire Officer Sidney Herbert Powe, who was badly injured, said when he arrived he found water and foam being used. He stopped this because it was dangerous, and while they were waiting for sand to be fetched the main explosion occurred.

Mr. W. H. M. Drake (chief officer Shropshire fire service) said he had been worried about six previous fires at the two premises owned by Frankel. A few hours before the explosion he telephoned the factory inspector because he had been told by one of his officers who attended a fire at the works the night before that conditions were "appallingly bad."

Mr. William Lewis (chemist at the West Midland Forensic Science Laboratory) said the only method to deal with the fire was to cover it with sand and hope for the best.

Dr. Donald Mathieson (inspector of factories, chemical branch) said he thought there was a primary explosion of hydrogen, followed by a secondary explosion of aluminium powder and charred or uncharred paper. Mr. J. V. Lander (coroner), summing-up, said there was no evidence of criminal negligence.

Jubilee Bonus

Workers in the 80 firms controlled by the Bleachers' Association, Ltd., the £4 million Manchester textile combine, are to share a £25,000 jubilee bonus to celebrate the 50th anniversary of its founding.

THE GROWING FIELD FOR METALS

Exhibition Illustrates Many Essential Roles

THE importance of the application of metals and their many alloys in science, industry and the domestic field is emphasised in an exhibition "Metals in the Service of Mankind" which was opened by Princess Margaret at the Science Museum, South Kensington, last week.

The exhibition, organised by the Institute of Metallurgists in conjunction with the Science Museum and the major metallurgical research and development associations, reveals historically and technically the story of metals and their alloys.

Modern practice in the extraction and refining of the common metals is amply illustrated, and some of the varied applications of such metals as iron and steel, aluminium, copper, tin, nickel, lead, magnesium, cobalt and cadmium are shown by samples, models and finished products.

The importance of metals in chemical engineering is exemplified in the copper section by a model of a rectifying still.

In the tin section are demonstrated two unusual applications of tin. One is the use of tin oxide (SnO_2) in porcelain enamel for opacifying and the other shows hanks of silk, of which the "handle" and "scrunch" have been improved by immersion in solutions of tin (stannic chloride) and then hydrolised, leaving a tin oxide film on the fibres.

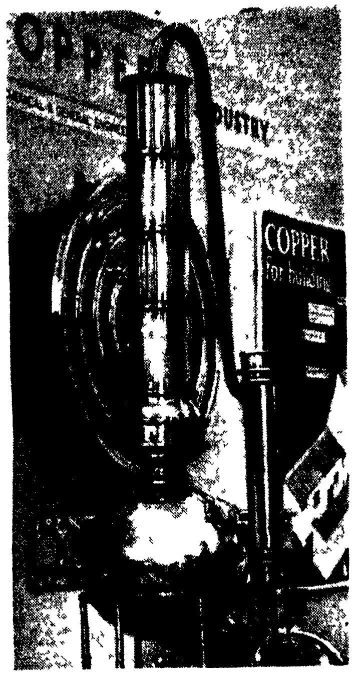
The Nickel Story

The wide range of uses of nickel in synthetic fertilisers, sterilised and processed foods, precision instruments and detergents is shown in diagrams and pictures. The main developments over two centuries, from its separation by the Swedish chemist Cronstedt in 1751 to production of the nickel-chromium alloys with high-temperature properties, are distinguished and tabulated. The refining of nickel by the carbonyl process is explained by models.

Powder metallurgy, the special technique which is proving of increasing importance in metal fabrication, is represented by samples of porous bronze used for filters for liquids and gases, mixers and diaphragms.

Welding processes and research illustrate the part played by this technique in pressure vessels, pipe lines and in the chemical industries.

One of the most interesting sections is devoted to the 12 rarer metals and provides a glimpse into the future of metal technology. The illustration of the electrical properties of gallium represents a new field of research from which important results are expected.



This scale model of a distillation plant illustrates one aspect of the wide adaptability of copper

Testing of metals before they are put into service, which may be very exacting, is represented by one entire section, devoted to some of the usual tests for finding strength, hardness, and resistance to shock and creep.

The metallurgical laboratory section shows the techniques adopted to ascertain the composition and properties of metals. It reviews reduction, purity, refractories, control, melting, working, microscopy, X-ray diffraction, composition heat-treatment, failures and chemical analysis.

The handbook and catalogue contains 11 chapters, presenting the story of metals in non-technical language for those who have no serious acquaintance with metallurgy. The exhibition will remain open until the end of September.

INFLATED METAL COSTS

Federation President on Effects of Bulk Purchase

DIFFICULTIES which beset the non-ferrous metal industries, particularly those associated with bulk purchasing by the Government, and the increased cost of metals, were discussed by Mr. William H. Henman, in his annual report, following his re-election as president of the British Non-Ferrous Metals Federation on July 6.

Mr. Henman expressed his thanks to the annual general meeting and said that he deeply appreciated the honour which had been accorded him by the industry.

" I have this year completed 50 years' active work in the industry," said Mr. Henman, "and as I look back to the beginning of my industrial career and compare the conditions of those days with the conditions of the present, like many of the older among us, I notice some very remarkable changes."

Gains and Losses

"There have been enormous advances on the material side. There has, of course, been one major change in the structure of the industry which is not peculiar to our industry, and which has profoundly altered the whole industrial life of the country. Today, the owners have, very largely, been replaced by the management. I think something has been gained, but I am quite sure that a great deal has also been lost by this change, which, however, has become quite inevitable as a result of the much larger scale and heavier financial burden of modern industry.

" There is one outstanding change of a practical kind. I refer to the cost of the metals in which we work. When I was a young man copper cost about £50-£60 a ton, and zinc about £20-£25.

" Most of us remember the days in the early 'thirties when copper went down to £25 a ton and zinc to £9. It was still possible then to regard the non-ferrous metals as base metals. To-day they have almost entered into the realm of semi-precious metals. The price of copper is £186 a ton and the price of zinc is £127 10s. Copper is only a few pounds below the record price which it reached during the Continental blockade during the Napoleonic Wars, when manufacturers were forced to melt down the copper coinage of the realm whose face value was less than its copper content.

" Zinc, on the other hand, is already far above any figure ever reached in the history of the metal.

" The general changes which have taken place in the value of money and in our conceptions of cost and worth will, of course, account for some increase, such as we have seen in most commodities, but the present astronomical figures are not due solely to monetary causes; still less are they due to any natural cause in the way of absolute shortage or of insuperable mining difficulties.

" They are due, first and foremost, to the fact that, five years after the war, we are still operating under the wartime system of bulk purchase. The London Metal Exchange is closed for dealings in copper and zinc, and, under the arrangements made between the Ministry of Supply and the Empire producers, the price paid for the whole of our imports is linked at a devalued rate of exchange to the transatlantic price. This price itself is largely influenced by the stockpiling policy of the American Government and bears no direct relation to production costs. The Ministry of Supply is to-day taking approximately £6 a ton above the f.a.s. New York price for copper and £7 10s. a ton for zinc."

Burden of Costs

"There is every reason for alarm at the high level of costs to-day, especially when it is borne in mind that the element of raw material accounts for anything up to 90 per cent of the cost of the articles we sell. This heavy burden has to be borne by all the manifold and varied industries which use our finished products, including some of those which are making the most valuable contribution to British exports to-day, such as the motor industry, electrical engineering and cables, shipbuilding, and general engineering.

" It is an inescapable economic law that, where the price of an article remains for a long period substantially out of relation to the price of its potential substitutes, the user is bound to turn to such substitutes. We here know that, for practically all its present applications, there is no acceptable substitute for copper and its alloys, but there are several materials which are not a bad second best for certain purposes, and one can foresee a situa-

(continued on page 82)

PRODUCTION PROSPECT FOR POLYSTYRENE

First Stage in a New British Plastics Industry

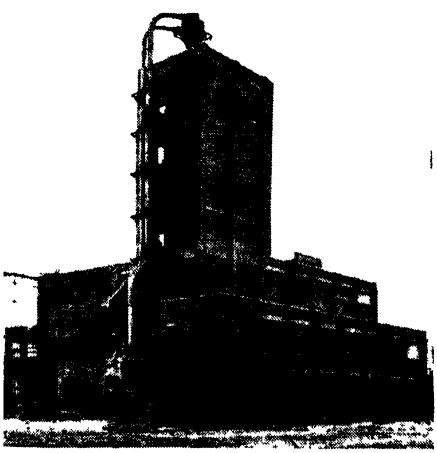
PRODUCTION of the first polystyrene made commercially in the United Kingdom is to begin at the middle of this month. Announcing this, Monsanto Chemicals, Ltd., which is undertaking the innovation at its Newport works, says that this thermoplastic injection moulding material has come to be regarded as one of the most versatile of the plastics in the U.S.A.

The Monsanto product, Lustrex, is a hard substance which will be available both in its natural colourless form and in colours. Its resistance to water, acids, alkalis, fats and waxes is very high. The company states that its electrical characteristics are outstanding and that it has the best insulating properties of all synthetic resins.

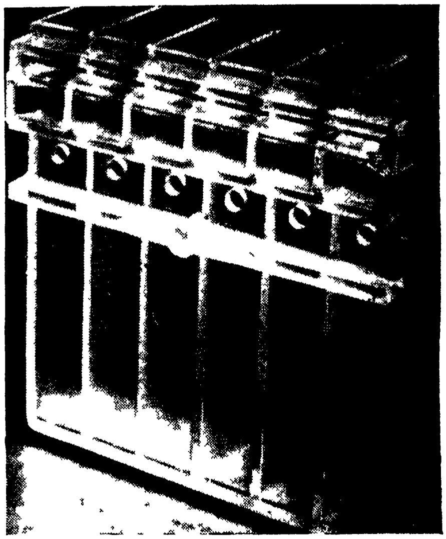
Dependence on Dollar Sources

The only large-scale source of polystyrene for British industry has hitherto been the United States and Canada, and a condition of its importation in Great Britain has been that 90 per cent of the end products should be exported. Production at Newport should result in some relaxation of restrictions on home market uses and permit an increase of exports of plastic products. It will also yield a valuable dollar saving in the sterling area.

The story of Lustrex, says Monsanto, exemplifies a peacetime industry developed



The new Lustrex unit at Newport



This example of battery casing represents another important use for which the high resistance to heat, shock and acids makes polystyrene particularly appropriate

from a wartime priority need. Before 1939 the thermoplastic was made on a relatively small scale from styrene monomer. After 1939, styrene monomer was needed in great quantity for manufacture of American synthetic rubber and production was increased accordingly. Monsanto built the Texas City plant on U.S. Government commission and, after the war, bought the plant for its own use.

British production will initially be based on imported styrene, but later requirements will be met by indigenous production. Forth Chemicals, Ltd., will produce styrene monomer at a new plant to be erected in Scotland.

In the United States, Lustrex is already used in a wide range of industrial and household products, which with freer supply of Lustrex, should become increasingly available here.

Notes from the U.S.A.

A number of indications of the likelihood that the advent of polystyrene polymer will have important effects in U.K. plastics industry are to be found both in the

interesting chemical and physical properties of the material and the high rate of development since it was introduced in the U.S.A.

Discussing the possibilities in London last week, Mr. E. A. O'Neal, jun. (chairman of Monsanto Chemicals, Ltd.) mentioned the expectation of providing in this country an adequate supply of monomeric styrene, from which the plastic is produced by polymerisation, from the ethylene gas which would come from the new refinery at Grangemouth. That should be completed in two years. The other source was benzene from coal, so that there were excellent prospects for production from indigenous supplies.

To indicate how wide were the fabricating possibilities, an extremely varied display of Lustrex products, sent by the American Monsanto Company, was put on view. It fully confirmed some of the claims made for this material, such as its ability to serve as a successful replacement of glass, metal and wood in most applications and some very original ones. All the pieces reflected the good injection moulding properties, low weight and colour effects. A useful characteristic is the ability to produce at one shot either small items (toys and fruit punnets weighing an ounce or two) to refrigerator parts and kitchen cabinets. Some of the latter may weigh up to about 20 lb.

Other indications of good prospects for the new polymer were the facts about the extremely rapid expansion witnessed in the U.S.A. outlined by Mr. J. Turnbull, on a visit to London from the American company. He indicated how general is the acceptance of plastics in the U.S.A. by the fact that distribution in 1949 was estimated to be about 11 lb per head of the population (against about 2 lb. in this country) and it was estimated that by 1958 the *per capita* figure for plastics in the U.S.A., in free competition with metal, glass and wood, would be 15 lb. This year the Monsanto Chemical Company would produce 240 million lb. of Lustrex, of which the total in 1945 was 6 million lb. The company was producing yearly 80,000 tons of monomeric styrene for plastics and some of the synthetic rubbers.

INFLATED METAL COSTS

(*continued from page* 80)

tion in which British industry might well be compelled, for reasons of price, to turn to newer materials. This would be to the detriment not only of our own industry, but also, in the long run, of their own products which would be less efficient for their purpose.

"Such a situation, if carried too far, might at no very distant date have very serious repercussions on the world mining situation, and, if a number of our mills were forced to close down, on the strategic position of this country and her allies near and far. I cannot too strongly emphasise the Federation's view that it is vital that the prices of copper and zinc, and other non-ferrous metals, should come down to a more reasonable level at the earliest possible moment.

"I have so far been speaking chiefly of the absolute level of prices, but it should also be borne in mind that manufacturers in this country are in certain respects at a disadvantage compared with those in other countries who are able to obtain their raw materials at prices more closely in line with the so-called world price. This disparity might well develop into a serious competitive weakness for the exporting industries of Great Britain.

"This is perhaps an appropriate moment to pay tribute once again to the excellent understanding which exists between the representatives of the Ministry of Supply and of the federation, who are in the habit of meeting at regular intervals to discuss the problems of the industry. So far as it is possible, within the limits of Government policy, with which we do not agree, we find the officials of the Ministry of Supply most helpful and understanding. In fact, the only criticism we have against them is that they should not be in the business at all!

"I should mention one important point in connection with price levels in which the federation has obtained a certain degree of satisfaction from the Ministry. I refer to the premiums for forward purchase which, on our representations, were recently substantially reduced, thereby minimising to some extent the disadvantages at which we have been placed. This is a step in the right direction and we welcome it as such.

"We are, however, still constant to our conviction that the only way to restore sound health to the metal world is to put an end to the present system of bulk purchase by the Government, and to restore free trade in all metals."

Japan Mining More Pyrites

Japan's monthly average pyrites output mounted last year to 127,900 tons, as compared with 94,800 tons in 1948 and only 38,700 tons in 1945.

SOAP RATIONING TO END

Improved Supply of Raw Materials

AN end of soap rationing, which has been in force since February, 1942, was announced by Mr. Maurice Webb, Minister of Food, in the House of Commons this week. The present ration system, which provides 24 oz. a person for each eight-week period, will cease on September 10.

In his statement, Mr. Webb said that the recent improvement in supplies of raw materials had enabled the further extension of free buying of this essential domestic commodity.

" This improvement," he said, " is so substantial and, on the most careful estimate, certain to continue that I have found it possible to proceed at once with complete derationing instead of taking the interim step of increasing the ration. I am making the announcement now to enable manufacturers to use their raw materials to produce enough soap, including soap powders, to meet the probable demand when rationing stops."

Mr. J. Harrison asked if the Minister had made sure that there would be no shortage of certain qualities of soap. Mr. Webb: I think we have over-insured ourselves against that possibility.

Dr. Somerville: Is the Minister satisfied that, when soap is derationed, the prices of various kinds will not be raised?

Mr. Webb said that prices would continue to be controlled. He added that the Ministry would also maintain control over the distribution of raw materials, but manufacturers were quite happy about the arrangements made.

A note from the Board of Trade points out that up to September 10 the soap rationing scheme will also continue to operate in full for traders, and order forms and buying permits relating to supplies for the eight-week period beginning on August 13 should continue to be passed to suppliers in the normal way.

Cyanide Gas Fatality

The starting of a compressor engine which caused the air in the engine-room to circulate and brought in a pocket of cyanide gas, with which the ship had been fumigated, was said by a Bibby Line official to be the cause of 42 seamen in the 10,600-tons liner *Cheshire*, berthed at Birkenhead, being affected by the gas recently, one of them fatally. He added that, after the incident, the vessel was soon cleared of gas and normal work resumed.

U.K. EXHIBITS AT CHICAGO

Only Two Chemical Groups

AMONG the 150 British firms whose names appear in the early list of intending exhibitors at the Chicago International Trade Fair (August 7-20) are only two actual manufacturers of chemicals, Imperial Chemical Industries, Ltd., and the Watford Chemical Co., Ltd. In addition to these, however, there are several British exhibitors of allied products, including the Furmoto Chemical Co., Ltd., who are manufacturers of metal, shoe, furniture, etc., polishes, and Bakelite, Ltd.

The stand of I.C.I., Ltd., at Chicago will be designed to present products, services and scientific achievements. It will be the first time that I.C.I. has exhibited in the U.S.A., and space limitations will permit only a small cross-section of the company's 1200 products to be shown. The display will show how the company's overseas selling organisation covers nearly every country in the world except Russia and some of her satellites. Among the products of the I.C.I. £11 million yearly research programme to be shown are Paludrine, Methoxone, Polythene, the Gammexane range of insecticides, and Antrycide.

There will be a series of diorama models showing users of colour throughout the ages. These were originally shown on an I.C.I. stand at the BIF in London.

Corroded Boiler Exploded

QUESTIONS about the chemical action of water on metal boilers were asked at the resumed inquest at York on July 4 on Arthur Henry Horwell, 48, boiler cleaner, of York, who was killed when a boiler at the Foss Islands power station exploded in the early hours of October 27, 1949. A verdict of " Accidental death " was returned. The explosion wrecked the boiler house, and Horwell's body, buried beneath the debris, was not recovered until seven days afterwards.

The official inquiry into the explosion is being conducted on behalf of the Ministry of Transport by Mr. John George Charlton, senior engineer and surveyor, who stated that he found in the boiler a crack from the outer row of rivets which stretched practically the whole length of the drum. The cracks were not due to stresses, and the evidence suggested that the explosion was due to some form of stress corrosion.

Basic Chemicals in April

Generally Higher Production Levels

PRODUCTION levels of basic chemicals in April were generally higher than in the same month of 1949, but stocks of sulphur and pyrites declined. Figures for molasses and industrial alcohol in April 1950 are not yet available, but among fertilisers there was an increase in production and consumption. Among the non-ferrous metals, production rose except in aluminium and magnesium, while, apart from zinc, stocks improved. Stocks of refined lead and zinc concentrates were about doubled.

Estimated numbers employed in the chemical and allied trades for April (in thousands) were 444.0, being an increase of 12.4 over the corresponding month in 1949, and slightly higher than in March this year. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 256.8 (189.0 men, 67.8 women); paints and varnishes, 38.3 (27.2 men, 11.1 women); oils, greases, glues, etc., 66.9 (53.8 men, 13.1 women); pharmaceuticals, toilet preparations, etc., 82.0 (42.8 men, 39.2 women).

These figures and the table below are abstracted from the *Monthly Digest of Statistics*, No. 54 (H.M.S.O., 2s. 6d.).

	April, 1950 Thousand Tons			April, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	151.6	147.0	—	139.2	135.0	—
Sulphur	—	29 8	66.8	—	24.7	72.3
Pyrites	—	18 8	71.0	—	20.6	76.0
Spent oxide	—	16.4	179.9	—	15.9	168.0
Molasses (cane and beet)	9.0*	41.1*†	227.6*	10 3	26.8†	284.2
Industrial alcohol (mil bulk gal.)	2.69*	2.75*	0.61*	1.86	2.39	5.07
Ammonia	—	7.24‡	6.23	—	6.88	5.96
Superphosphate	19.1	28.4		18.1	22.0	—
Compound fertiliser	173.6	233.1		142 2	210.4	—
Liming materials ..	—	457 8	-	—	430.9	—
Nitrogen content of nitrogenous fertilisers	22 17	22.2	-	21.7	19.8	—
Phosphate rock	—	86.9	256.8	-	82.1	174.7
Virgin aluminium	2.43	12.2	—	2 66	15.8	--
Virgin copper	—	25.2	127.9		23 6	115.4
Virgin zinc	5.35	17.5	46.6	4 79	13.6	50.6
Refined lead	5.55	9.6	61.5	3.17	10.6	37.5
Tin	2.40*	2.23	—	2 37	1.66	20.5
Zinc concentrates	—	13.5	69 0		10.9	31.6
Magnesium	0.42	0.46		0.52	0 46	—
Pig iron	183.0	143.0	484.0	179 0	139.0	243.0
Steel ingots and castings (including alloys)	324.0	-	1,320 0	305.0	--	1,097.0
Rubber: Reclaimed	0.43‡	0.40‡	2.50	0.32‡	0.40‡	3.62
Natural (including latex)	—	4.20‡	39.6	—	3.28‡	47.0
Synthetic	—	0.05‡	0.84	--	0 04‡	1.82

* March, no April figures available, 1950. † Distilling only. ‡ Average of five weeks.

Canadian Synthetic Resins Development

MONSANTO (Canada), Ltd., in Montreal, has started an $850,000 programme for expansion and production of new materials. The most significant item will be the installation of equipment to manufacture for the first time in Canada butylated melamine and urea resins. These are important components in the newer type of baked enamels being widely used for automobile, stove and refrigerator finishes.

This marks another important step in raw material self-sufficiency in the fast-growing Canadian plastics industry. Prior to this all these resins have been imported from the United States. Monsanto and Dow Chemical of Canada already meet the entire domestic requirements of polystyrene, one of the largest items in the raw materials picture. At the moment, neither the American or Canadian plants can satisfy the demand for this product. Another feature of the new production plan is the projected setting up of installations for the manufacture of PVC resin and enlarged equipment to modernise production of liquid phenolic and urea resin glues for the plywood and furniture industries.

Parliamentary Topics

THE REBATE or deduction on home produced hydrocarbon oils was again the subject of discussion during the consideration of the amended Finance Bill. Mr. Selwyn Lloyd moved that an amendment should give a guarantee that any such deduction would not be diminished for a period of 12 years. The industry, he said, was now at a critical stage of its development and re-equipment, and needed security. If the preference was diminished or disappeared, home production of benzol from coal gas might become uneconomic, and more oil would have to be imported. Distillation and recovery plants might well have to close down and the profitability of coke oven plants would be affected. There would be an indirect effect upon the chemical industry.

Supporting the amendment, Mr. Aubrey Jones said that if a preference was terminable at a moment's notice (as could happen as the Bill now stood) there was clearly no inducement for the industry to re-equip. The period of 12 years was the average life of the necessary plant.

Mr. Douglas Jay, Financial Secretary to the Treasury, agreed that a case had been made out for continuing the preference at present enjoyed by indigenous hydro-carbon oils. He could not, however, see the force of a specified number of years. Security rested not so much on a guarantee as on the good sense of future Governments and Parliament.

The amendment, which was also supported by Lt.-Commander Guernsey Braithwaite, Sir David Maxwell Fyfe and Sir H. Williams, was defeated by 275 votes to 252.

PROGRESS of British national research with the problem of harnessing atomic energy for industries, travel and other peaceful purposes was raised in a question by Mr. Hector Hughes. Replying, Mr. G. R. Strauss, Minister of Supply, stated that considerable progress had been made in preliminary planning of nuclear reactors for use as power units. New high voltage machines and other facilities required for investigating components and materials which may be used in such reactors have been completed at Harwell. A programme for the construction of the first experimental power reactors was being prepared. Deliveries of radioactive isotopes from Harwell for medical, scientific and industrial use were meeting all home and export demands.

THE sanctioning of the establishment of an oil refinery approximately opposite that at Fawley across Southampton Water, were questioned by Surgeon Lt.-Commander R. Bennett. The decision to erect a new oil refinery plant somewhere off Southampton Water between Southampton and Portsmouth was reached after thorough investigation, stated Mr. G. Bottomley, Secretary for Overseas Trade, in a written answer. Suitability of sites in other parts of the country and proximity of markets for the refined product had been taken into consideration.

PROBLEMS concerning the recognition of a minimum standard of efficacy of disinfectants were raised by Dr. Charles Hill, who asked the Minister of Health if he would consult the Medical Research Council on this matter. Mr. A. Bevan, in replying, stated that he was already in touch with the Medical Research Council and had asked the technical authorities to lay down standards. Although the matter had now been pursued for nearly five years, the intricacy of the problem was such that no standards had yet been achieved.

MR. G. R. CHETWYND asked the Minister of Works why German cement was being offered for sale at West Hartlepool at double the price of home cement. Mr. R. R. Stokes, the Minister, replying, said that this was being imported by private firms and the selling price was not controlled. The 80,000 tons of cement and clinker ordered by his Department was being sold at the price of home cement.

QUESTIONED about the accident at the Consett Iron Company's works, Durham, on July 1, Mr. J. Freeman, Parliamentary Secretary to the Ministry of Supply said that the cause of the escape of carbon monoxide gas was being investigated by one of His Majesty's inspectors of Factories. He expressed the sympathy of the House for the bereaved relatives and the injured.

More Chemicals Liable to KID

Additions, from July 1, to the list of chemicals liable to Key Industry Duty, are: α-azoisopropyl cyanide; ethylenethiourea; barium manganate; benzyldimethylcarbinol; benzyldimethylcarbinyl acetate.

CONGRESS OF WORLD MICROCHEMISTS

Some British Contributions to Analysis

THE first international microchemical congress was held in Graz, Austria, from July 2-6. Twenty-six countries were represented and 118 lectures were given.

Among the papers read by the United Kingdom scientists was one by R. Belcher and R. Goulden, of Birmingham, on "The determination of carbon and hydrogen in fluorine-containing organic compounds." The method given is that the combustion of the sample, contained in a silica combustion tube, is effected in a purified oxygen stream at a flow-rate of 4 ml./min. Oxidation of the products of combustion is completed by passing them over a platinum contact heated to 750°C., after the manner of Friedrich. Silver wool at the same temperature ensures removal of sulphur and halides, including fluorine from any hydrogen fluoride produced. Granular sodium fluoride at 250°C. is used to absorb silicon tetrafluoride. The water vapour and carbon dioxide are determined in the usual way by absorption in magnesium perchlorate and soda-asbestos respectively.

Results

Satisfactory results have been obtained in the analysis of 4 mg. samples of compounds containing the elements C, H, O, F; the standard deviation of the results for hydrogen being about ±0.1 per cent H and for carbon being about ±0.2 per cent C. Preliminary work indicates that compounds which contain no hydrogen—the $C_n F_m$ type—may be analysed if water-vapour is introduced into the system. Analysis cf nitrogen-containing compounds has yet to be tried. The apparatus includes certain refinements which are suitable for incorporating in the conventional procedure.

Another interesting paper was that read by A. K. Al Mahdi and C. L. Wilson, of Belfast, who presented "The separation of metal-organic complexes." The first point made was that various separations of ions by so-called inorganic chromatography on alumina and similar columns have been described in the literature.

However, the processes involved are properly regarded as ion-exchange rather than true chromatographic adsorption. Partly because of this, theoretically complete separations are not achieved by this method, the bands formed by different ions usually overlapping to a greater or less extent. The method of passing solutions of ions through columns consisting of, or impregnated with, organic reagents equally cannot be regarded as true chromatography, since it is probably dependent on the relative solubilities or stabilities of the complexes formed *in situ* on the column. Since many complexes formed between inorganic ions and organic reagents behave as covalent compounds and are soluble in organic solvents, true chromatography of suitable mixtures of these complexes should be possible, resulting in separations strictly comparable with those achieved in the organic field.

A number of excellent separations of this nature have been achieved. The sensitivity of these is high, and they are notably different from the earlier methods in that, as in partition methods, the bands due to the different metals are completely separated.

A further British treatise was that of G. F. Hodsman, of London, who dealt with "Developments in microchemical balance design." After a brief historical introduction and some observations on the importance of the balance as a tool in microchemical analysis, reference is made to the need for a clearer distinction between the meaning of the terms "sensitivity" and "precision" as applied to microchemical balances. These terms are defined and the factors, such as observational, instrumental, and conditional errors which affect precision, are briefly reviewed.

The design of the modern microchemical balance is discussed, showing how new methods and techniques enable the chemist to obtain higher sensitivity and precision. Reference is made to new theories concerning the design of more reliable bearings, and the possibilities of new bearing materials are considered. The design of microchemical balance beams is discussed, and the importance of corrosion resistance, non-magnetic materials, strain relief, and stress analysis is emphasised.

Standardisation

Reference is also made to the value of standardisation of physical dimensions of microchemical apparatus, as a first step towards standardisation of weighing facilities provided on microchemical balances. The inter-relation of sensitivity and precision is considered from a theoretical viewpoint, and the practical applications of the results are mentioned, showing how specifications should be compiled so as to be of maximum value to the microchemist.

DETERMINING MINERAL NUTRIENTS

Microbiological Aspects of Bioassay

AT the meeting of the Fertiliser Society at Bristol recently, Dr. D. J. D. Nicholas read a paper dealing with a method of determining mineral nutrients in soils and plants, using *Aspergillus niger*. Because of the extreme sensitivity of the method, especially for Mo, it has been used to determine micronutrient levels in extracts of fresh plant tisues and in the ash of plants.

Dr. Nicholas explained that the bioassay method applied to soil problems has shown Mg deficiency in the presence of K deficiency, a point not detected by the chemical analysis of crop plants. Deficiency of Cu in alkaline fen soils was shown, where cereal crops were affected, and in sandy soils where fruit trees had dieback symptoms. Other deficiencies shown by this method were those of Zn in a soil where apples and pear betrayed "little leaf" effects; Mo in acid soils where brassica crops exhibited "whiptail" symptoms and Mn in soils where farm and vegetable crops show deficiency.

Microbiological methods for the determination of mineral nutrients in soil using fungi of the genus *Aspergillus* were introduced by Russian workers mainly for the determination of P in soils. Smith and Goodwin respectively have used the method for the assay of available P and K in British soils. Steinberg has made a thorough investigation of the mineral requirements of *Aspergillus niger* under differential supply of C and S compounds. Smit and Mulder have used the fungus to study the available Mg and Cu in Netherland soils.

Essential Nutrients

The method of bioassay proposed is based on the fact that the fungus will not complete its life cycle unless certain mineral nutrients are present in the culture medium. These are the macronutrients N, P. K, Mg and S, and the micronutrients Zn, Cu, Fe, Mn, Mo and possibly Ca, and V. The response to the addition of an essential mineral element from deficiency to sufficiency levels, when others are present in adequate supply, is specific and quantitative.

The standard growth series for an essential mineral element may be prepared by using as criteria the growth of mycelium, development of spores and dry weight yields of the fungus. For bioassay work a known amount of the test material to be examined, *viz.*, soil, extracts of fresh plant tissues, or the ash constituents of plants, is added to a standard culture solution containing all the mineral elements other than the one to be determined. The growth of the fungus, under condition of test, depends on the amount of mineral nutrient it derives from the material added, and the test element may be assessed by reference to the prepared standards.

Purification of Dextrose

Special procedures for the purification of the mineral macronutrients and dextrose used in the culture solution are necessary for the bioassay of Mg, Cu, Zn, Fe, Mn and Mo respectively. The following nutrients may be removed from a solution of inorganic mocronutrients and dextrose:

Magnesium. Recrystallisation of precipitation with 8-hydroxyquinoline at *p*H8. (Phosphates are omitted in the latter method of purification as they are precipitated in alkaline solution).

Iron. Co-precipitation as a quinolate in the presence of Fe, using 8-hydroxyquinoline at *p*H 5, and, after filtration, the removal of the residual quinoline with redistilled ether.

Copper. Removal with dithizone CCl_4 at *p*H 4, or precipitation with added Cu or Cd as a sulphide, using H_2S. Elimination of H_2S by boiling.

Zinc. Extraction with dithizone in CCl_4 at *p*H 6 or co-precipitation with Fe using 8-hydroxyquinoline at *p*H 5.

Molybdenum. Co-precipitation with Fe or Al with 8-hydroxyquinoline at *p*H 5, or (preferably) as a sulphide in the presence of Cd, Cu, Hg and Pb using H_2S. The addition of I_2 in KI simultaneously with H_2S precipitation facilitates the removal of further amounts of Mo, presumably because there is formed colloidal S which acts as an additional collector of the element.

Manganese. Using sodium diethyldithiocarbamate, and removal of the complex in CCl_4. Excess organic reagent is removed by the addition of Cu, and excess Cu by precipitation as a sulphide.

In all instances the purified mineral macronutrients and dextrose are used for the full nutrient cultures and the micronutrients are added later. Following this

procedure, any phytocidal effects caused be observed. Mineral micronutrients, of analytical reagent standard, for test are analytical reagent standard for test are recrystallised from glass-distilled water, using redistilled alcohol to enhance yields. Their purity should be checked by spectrograph before use.

Using these methods satisfactory growth curves are obtained for the following mineral nutrients, as µg per 50 ml culture solution:—Mg, 25 to 500; Cu, 0.05 to 2; Zn, 0.1 to 5; Fe, 0.01 to 5; Mn, 0.01 to 2; Mo, 0.0001 to 0.02.

Metabolism of the Fungus

In conclusion, Dr. Nicholas pointed out that little is known of the rôle of the micronutrients in the metabolism of the fungus. Molybdenum is required for the reduction of the nitrate N to ammonia N, as indicated by the fact that its requirement for Mo is considerably reduced when urea N or ammonium N is the only source of nitrogen. Moreover, in the absence of Mo, when nitrate N is the sole source of nitrogen, nitrate N accumulated in the fungus, and little amino N was detected, as in the instance of a trace of glutamic acid only. With more Mo, however, the nitrate N fraction decreased and the free amino N increased in the fungus, thus indicating that nitrogen metabolism was proceeding more normally.

Field to be Explored

The extent of the field yet to be explored in determining the function, and in some cases the identity, of mineral trace elements as plant nutrients was made clear by Dr. E. J. Hewitt in a paper describing the production and effects of micronutrient deficiencies in sand and water culture techniques.

He made clear the exacting requirements to prevent contamination made necessary by the extremely small quantities involved. Accidental inclusions might, for example, occur through the deposition of dust or through precipitation. Sufficient zinc for the season's growth of a plant may well be conveyed by air-borne dust, as the considerable accumulation on a glass slide in one month of all micro-nutrients went to show.

The molybdenum content of the seed of beans or the copper content of rye was known to modify the response of the plants grown with these deficiencies. In the search for yet unrecognised micronutrients the composition of the seed may require consideration.

The gaps in present knowledge were indicated by such facts as the recent identification at Wisley, by Wallace and others, of copper deficiency as the cause of exanthema and summer die-back of apple trees.

While molybdenum deficiency had only recently been identified in the field, other micronutrient deficiencies of higher plants were not yet known.

Reports on the need for aluminium, silicon, chlorine and gallium needed substantiation and little work had yet been published. Recently it had been shown that cobalt was essential to the production of a growth factor by certain micro-organisms (*Lactobacillus* and *Staphylococcus*), and this element might yet prove to be a plant micronutrient.

The consideration of deficiency effects could not exclude some study of the fact that toxicity may also occur in some instances. Excess of zinc or copper readily induced iron deficiency in many plants and excess of manganese might produce characteristic toxic effects such as leaf cupping and decrosis in *Brassicae*, or iron deficiency, as in oat or soya bean.

Excess of boron caused scorching of older leaves in many plants and might resemble lack of potash. Molybdenum excess might appear as blue or yellow pigmentation, due to combination with anthocyanins or tannins, or resemble ammonia toxicity.

The effects of excess of zinc or manganese, especially with respect to iron deficiency were greatly accentuated by additional molybdenum, and it might be concluded that the interrelationships and rôles of these elements were complex and still far from completely understood.

Overseas Research Scholarships

OVERSEAS research scholarships for 1950 of £350 or £400 a year for two years, announced this week by the Royal Commission for the Exhibition of 1951, included the following:—

CANADA: N R F. STEENBERG, (Queens University, Kingston, Ontario), nuclear physics at Oxford University; R. M. STOW, (Saskatchewan University), physical chemistry, Cambridge University.

AUSTRALIA: F. A. L. ANET, (Sidney University), organic chemistry, Oxford University; P. J. FENSHAM, (Melbourne University), physical chemistry, Bristol University; L. M. JACKMAN, (Adelaide University), chemistry University College, London; P. M. NOSSAL, (Adelaide University), biochemistry, Sheffield University.

NEW ZEALAND: L. S. WOLFE, (New Zealand University), animal physiology and biochemistry, Cambridge University.

INDIA: R. C SAHNEY, (East Punjab University and National Physical Laboratory, Delhi), physical chemistry, Cambridge University.

PAKISTAN: R AHMAD, (Punjab University), chemistry, Cambridge University or London.

REPUBLIC OF IRELAND: S. R. DUFF, (Dublin University), organic chemistry, Oxford University.

RAW MATERIALS FOR PAINTS

International Agreement on Standards

THE first meeting of the technical committee for raw materials for paints was held in Zurich from June 26 to June 30. This is a revival of a pre-war committee, formerly part of the International Standards Association, which has since been replaced by the International Organisation for Standardisation.

It was agreed to begin from the point reached by the work in 1939. It is not intended that any agreements reached should be published as international standards, but they are to serve as a basis of national standards in the various countries, of which 11 were represented at the meeting.

The British delegation, organised by the BSI, was led by Mr. E. W. Plowman. Other members were Dr. A. Bowman (titanium pigments), Mr. G. Claxton (solvents), Dr. H. Mills (fine pigments), Dr. C. W. Price (lead pigments), Dr. L. A. Jordan and Mr. P. Cutbush.

It was agreed that the general scope of the pre-war committee should be continued, and that the work should be confined to raw materials, and should not include finished paints. The United Kingdom was asked to undertake the secretariat of a sub-committee for the subject of terminology.

A draft specification for red lead was discussed and a revised draft will shortly be circulated for the approval of the co-operating countries, when final agreement has been reached on certain of the test methods.

White Lead

A draft specification for white lead was also accepted, again subject to agreement on certain test methods. There was considerable discussion of the methods of determination of oil absorption, reducing power and hiding power of pigments, in order to set up a basis on which acceptable test methods might be drafted. This resulted in the United Kingdom being asked to act as secretariat of a sub-committee for test methods and sampling generally.

There were discussions concerning zinc oxide and lithopone and, on the tentative agreements reached, draft specifications are to be founded. It was agreed that the draft for zinc oxide should set out the requirements for three qualities, extra pure, normal and "lead-containing", the last to have a maximum of 3 per cent Pb. For lithopone it was decided at present to confine the draft to one quality only.

In the oil group the limits agreed and the methods of test for linseed oil for paint, boiled oil and refined linseed oil were very close to the current British Standards. It was agreed to consider the inclusion of a test for the presence of fish oil and also a simple method for the measurement of "foots". It was agreed that a draft for tung oil should be prepared on the basis of B.S.391-1949 and circulated for comment.

Dehydrated Castor Oil

There was general agreement that the time was not yet ripe for a specification for dehydrated castor oil. As a result of the consideration of a preliminary draft for stand oil for zinc oxide it was agreed that a draft should be prepared for stand oil for all purposes and not merely for oils suitable for use with zinc oxide.

In regard to titanium it was agreed, at present, only to standardise the anatase and rutile forms of titanium dioxide, and not to include the reduced types. There was general agreement as to the specification and the United Kingdom was asked to prepare a draft.

A draft specification for turpentine, prepared by France, resulted in the decision that the word "turpentine" should be confined to gum spirit of turpentine and that the specification should deal only with this material. The secretariat had put forward drafts for a series of aromatic hydrocarbon solvents but, after discussion, the conference felt that, since the use of these materials was so much wider than the requirements of the paint industry, it would be advisable for the International Organisation for Standardisation to set up a separate committee to deal with these materials, and inform this committee of the interest of the paint industry in certain types.

100 Guineas from the Pharmacists

In token of appreciation of gifts from overseas to old and distressed chemists, the Pharmaceutical Society of Great Britain has sent 100 guineas to the Lord Mayor's Thanksgiving Fund.

RADIOMETRIC ASSAY AND RADIOACTIVITY

Principles and Methods of Measurement

THE method adopted of assaying a particular radioactive isotope has depended upon the nature and energy of the radiation associated with its decay, and upon such factors as the required sensitivity, precision or convenience. The last factor may be of overriding importance when dealing with the frequently large numbers of samples of a tracer experiment, stated Mr. F. P. W. Winteringham in a paper on "Radiometric Assay in Tracer Research," presented at a recent meeting, in London, of the Physical Methods group of the Society of Public Analysts and other Analytical Chemists.

Self Absorption of Tritium

Tritium, he said, decayed with such weak beta-emission that it ought to be assayed as a gas within the sensitive volume of a Geiger-Müller counter or ionisation chamber attached to a suitable electroscope. Self-absorption alone precluded its assay in external samples. Active samples had been recovered as water by ignition in oxygen.

$Carbon_{14}$ was most efficiently assayed as carbon dioxide within the sensitive volume of a gas counter. It might be assayed in prepared solid samples placed outside a thin window counter. The second method was much more convenient but much less efficient than gas counting.

Solid samples, however, might also be assayed by placing them inside a demountable counter through which was flowing a mixture of helium and alcohol vapour. This method had been found to be a useful compromise between the internal gas and external sample methods; its efficiency had been estimated to be about 80 per cent as compared to about 70 per cent obtained with a typical gas counting assembly and 10 per cent obtained with the thinnest end-window counter commercially available.

$Bromine_{82}$ decayed by the emission of beta particles and energetic gamma rays, which permitted a choice of methods according to the activity available. Active samples could be compared quite accurately at a distance from a suitable gamma-counter and self-absorption corrections were unnecessary.

High efficiency assay was achieved by suitably mounting silver bromide precipitates below a thin window counter. An experimental self-absorption curve obtained under these conditions agreed very closely with the curve calculated on the basis of the beta particle absorption alone.

Another paper, on "Radioactivation Analysis—Some Glimpses of its Scope," was by Mr. A. A. Smales, who said the principle of radioactivation analysis was that any element, or in fact isotope, which could be made radioactive could also in theory be determined by measuring this induced radioactivity. The potential scope of the method was therefore very wide, since many types of nuclear reactions were possible, and radiosotopes of almost all elements could be artificially produced. For example, with slow neutrons in a nuclear reactor, over 80 elements gave rise to active isotopes, many of which were convenient from an analytical point of view.

The potential sensitivity depended mainly upon the neutron flux available and the activation cross section of the particular element or isotope concerned. If a figure of 100 disintegrations per minute (*i.e.*, at least double the normal beta-particle background of the usual end-window Geiger tube assembly) were accepted as a limiting sensitivity for determination, and a flux of 10^{12} neutrons per sq. cm. per sec. assumed to be available (*e.g.*, in the Harwell pile), then it should be possible to determine several elements in quantities from 10^{-12} g. (*e.g.*, Eu, Dy) through 10^{-11} g. (*e.g.*, Ir, Rh, In, Tm, Lu, Sc, Au, Ag, Ho, Co, etc.) and upwards.

Activity of Sample and Standard

In usual practice the samples were irradiated simultaneously with standards, but not necessarily of the same general composition, but containing a known weight of the element concerned. The required element was chemically separated after the addition of an inactive carrier element—although in some favourable cases it might be possible to omit this step. Then the activities of sample and standard under similar conditions were measured after determining the chemical yields by conventional means; and by checking the radiochemical purity by decay and absorption measurements it was possible to calculate the weight of the element originally irradiated.

(*continued at foot of next page*)

ETHYLENIC COMPOUNDS

New Method of Synthesis

A NEW method for the synthesis of unsaturated compounds, particularly those containing one or more ethylenic groups adjacent to a carbon atom, has been developed in the organic laboratories of the Imperial College of Science at South Kensington. This has been described by Dr. E. A. Braude, Dr. C. J. Timmons and J. A. Coles, the workers concerned in the development of the method (*Nature*, 66, *4210*, 58). The method depends upon the preparation of the alkenyl lithium derivatives, and on their reactions with secondary components. Previously, it had been found difficult to synthesise certain tautomeric systems from α-alkenyl compounds because of the difficulty in preparing the Grignard reagents of this type, and also because of the complications encountered in some of their reactions.

Hence the possibility of using the corresponding lithium derivatives was considered, and, though the existing literature was discouraging—styryl lithium was said to be formed no more readily than the magnesium compound—yet it was found that highly purified isobutenyl bromide reacted readily with lithium metal in dry ether. Carbonation with excess solid CO_2 and isolation of the products yielded a mixture of 2:5 dimethylhexa-2:4-diene, β:β-dimethylacrylic acid, and phorone.

This novel method of alkenylation complements in some respects the procedures employing acetylenic precursors recently developed, and provides a new and convenient route to many types of ethylenic compounds, a number of which have not been easily accessible up to now.

RADIOMETRIC ASSAY AND RADIOACTIVITY

(*continued from previous page*)

Examples of determinations carried out in the Analytical Chemists' group at Harwell were: rubidium in potassium salts, sodium in aluminium compounds, HfO_2 in ZrO_2, iridium in rhodium—all without chemical separation; and arsenic in "arsenic-free" zinc and in GeO_2 where chemical separation was involved.

Apart from the remarkable potential sensitivity of this method, there was a further advantage that, since an inactive carrier element might be added after irradiation, such difficulties in handling sub-microgram amounts as losses by adsorption, blanks on reagents, etc., were largely avoided. Facilities for irradiation in the Harwell pile were available.

TIN RESEARCH

Institute's Laboratory Extensions

THE report on the work of the Tin Research Institute during 1949, which has recently been issued as a 16-page booklet, records the opening of technical service offices in the U.S.A., Belgium and Holland. The alterations and extensions to the institute's premises at Greenford, Middlesex, which are now taking shape, have caused a certain amount of interruption to the experimental work, but advantage has been taken of the altered circumstances by devoting more time to such things as the publication of up-to-date technical publications of practical interest, the institute's series of which now cover all the major applications of tin. Over 45,000 technical publications were sent out in 1949. Thirty-six per cent of the institute's literature went to America and to the United Kingdom 35 per cent.

The first section of the laboratory extensions, comprising a three-storey building, is completed and in use. This houses the institute's chemical and analytical laboratories, the corrosion section, photo-micrographic section, and part of the mechanical testing laboratory. The added space and facilities are stated to enable certain long-delayed projects to be commenced. The second section in the building programme consists of a two-storey building covering the quadrangle within the existing laboratories. This has gone forward more slowly to minimise interruption to the institute's work but is nearing completion. It provides accommodation for the library and information bureau, as well as a writing room and offices on the upper floor, and an engineers' store, heat-treatment department, and a foundry on the ground floor. The third section of the work involves alterations and rearrangements within the existing buildings. In this good progress has been made and the work is expected soon to be completed.

Technical and Scientific Register

THE total number enrolled on the Technical and Scientific Register at May 15, 1950, was shown in the June issue of the *Ministry of Labour Gazette* as 5308. This figure included 3566 registrants already in work but who desired a change of employment; 580 students provisionally enrolled, and 1157 registrants (including 456 ex-Service men and women) who were unemployed.

THE NEW FERTILISER PRICES

The Graduated Increases

THE first substantial rise in about 30 years in prices of chemical fertilisers became effective on July 1. (THE CHEMICAL AGE, 62, 885).

Details of the increases are set out in the Fertilisers (Charges) Order, 1950 (Statutory Instrument No. 1039) and show the rate of additional charge per ton. The principal provisions are these:—

Class I—Not incorporated in a compound fertiliser. (A) Not produced by the fertiliser manufacturer. Sulphate of ammonia £2 6s. 6d. Raw phosphate or phosphate rock, unground: not less than 71 per cent £3 8s. 9d; less than 71 but not less than 61 per cent £2 7s. 10d.; less than 61 per cent £2 1s. 4d. Raw phosphate or phosphate rock, ground, £1 5s. increased or reduced by 2s. 4d. each 1 per cent by which the percentage by weight of phosphoric acid (P_2O_5) in the material differs from 29 per cent.

(B) Produced by the fertiliser manufacturer. Raw phosphate or phosphate rock, ground, £2 7s. 10d. increased or reduced by 2s. 2d. for each 1 per cent as set out above.

(C) Whether or not produced by the fertiliser manufacturer. Ordinary superphosphate of lime £1 17s. 6d., increased or reduced by 4s. 9d. for each 1 per cent by which the soluble phosphoric acid in the material differs from 18 per cent.

Potash (in a form other than sulphate of potash) £2 10s., plus or minus 10d. for each 1 per cent by which the percentage weight of potash (K_2O) differs from 60 per cent. Sulphate of potash 8s. 4d., increased or reduced by 2d. for each 1 per cent by which the percentage weight of potash content differs from 50 per cent.

Compounds

Class II—Compound fertilisers. "Any compound fertiliser: The aggregate of the following rates per 1 per cent of the weight of that compound fertiliser which consists of a substance in respect of which the rate is specified, that is to say—the nitrogen contained in any sulphate of ammonia produced by the manufacturer of that compound fertiliser 2s. 4d.; the soluble phosphoric acid contained in any fertiliser material therein 2s. 1d.; the insoluble phosphoric acid contained in any ground raw phosphate or ground phosphate rock therein 8d.; the potash contained therein otherwise than in any sulphate of potash 10d.; the potash contained in any sulphate of potash therein 2d."

SIR JOHN CASS COLLEGE

Wide Range of Special Courses

STATISTICAL methods in scientific and industrial research will be the subject of a series of lectures by D. R. Read, B.Sc., A.R.I.C., F.I.S., in the forthcoming session of the Sir John Cass College, Jewry Street, Aldgate, E.C.3. The course, suitable for graduates, will consist of 24 lectures on the practical application of statistics to problems of manufacture and research. The first 12 talks, covering statistical analysis, will begin on September 25, at 6.45 p.m., the remainder, on design of experiments, on January 8 ,1951.

Other subjects included in the range of the diverse programme for the new session include the following lectures:

Wave mechanics and molecular structure by Professor C. A. Coulson, M.A., D.Sc., F.R.S. Modern theories of molecular structure for B.Sc. (Special) degree and postgraduate students engaged in industry. (Begins Tuesday, October 31).

Crystal physics and X-ray crystallography will be dealt with by L. A. Thomas, B.Sc., A.Inst.P., in two courses each of 10 lectures. The first, beginning on Thursday, October 5, discusses the physical properties of crystalline solids, and the second, starting on Thursday, January 4, 1951, explains the theory and methods of X-ray analysis.

Spectrochemical analysis, a course of 12 lectures on methods of emission and absorption spectroscopy for chemists and analysts will begin on Friday, September 29, and will be given by A. S. Nickelson, B.Sc., F.R.I.C., and A. R. Philpotts, M.A.

A practical working knowledge of thermodynamics for chemical engineers may be gained from the series of 16 talks by N. W. Roberts, M.A., F.R.I.C., which begins on Tuesday, October 10.

Chemical engineering is also catered for in the course of eight talks by J. M. Coulson, M.A., Ph.D., A.M.I.Chem.E., on heat transfer beginning on Friday, October 6, and in the series of eight lectures on distillation by G. A. Dummett, M.A., A.M.I.Chem.E.

Petroleum products, their applications, characteristics required and their modification, will be the subject of a series of 20 lectures which begin on Thursday, September 28. These will be given by a panel of lecturers experienced in educational aspects of petroleum technology.

Patent and registered design protection will be covered by Eric Walker, B.A., B.C.L., in a course of eight talks beginning on January 25, 1951.

OVERSEAS CHEMISTRY AND INDUSTRY

THE BIRTH OF CHEMICAL INDUSTRIES

Good Technical Background of Development in Israel

by H. REIK, M.Sc. (Eng.), A.M.I.Mech.E., A.M.I.E.E.

ISRAEL is a country of few natural resources. A limited amount of asphalt, gypsum and limestone is available and the main source of chemicals is the Dead Sea. The Palestine Potash, Ltd., used to produce and export quantities of potassium chloride, potassium sulphate, potassium bromide, sodium bromide, magnesium chloride and other chemicals based on the evaporation of large quantities of Dead Sea water in huge evaporating basins.

This process was interrupted by the hostilities, but steps are being taken to restart activities at the south end of the Dead Sea in the territory of Israel.

The lack of other basic chemicals has forced Israel to look for processes which will permit the production of chemicals from easily obtainable raw materials. The by-products of the Haifa refinery, which will soon restart at a small percentage of its full capacity, will be available, and the government has been considering the production of chemicals from petroleum. It is hoped that British firms will collaborate in this enterprise.

Dr. Weizmann with some of the staff of the Institute which bears his name

Many new processes have to be developed and problems peculiar to the country await solution. It is being recognised that these things can only be done by having local research institutes with scientists capable of tackling these problems and having the tools and environment enabling them to work successfully.

This need was realised some years before the second world war by some far-sighted Jewish scientists and particularly by the president of the Jewish State, Dr. Chaim Weizmann. This famous scientist, whose inventiveness helped the allies to win the first world war, is the founder and president of the Weizmann Institute of Science in Rehovoth. This is certainly the most impressive research institute of its kind in the Middle East.

Emphasis on Chemistry

Its spacious grounds are about 12 miles from Tel Aviv and it has been planned with a view of future expansion and congenial working conditions. The buildings are spacious and dignified and shaded alleys lead to the laboratories, workshops and staff quarters.

The main buildings are the Institute of Physics and Physical Chemistry and the Daniel Sieff Institute of Chemistry. New departments and extensions for biochemistry and bacterial chemistry, pharmacology and genetics are planned.

The director of the institute, Dr. Bergmann, is an organic chemist of world-wide reputation, as are many of the senior members of his staff. The research and development work done at the institute has a strong chemical bias. The equipment is first class, a mass spectrometer, electron microscope, X-ray diffraction unit, infra-red and ultra-violet spectrometers, ultra-centrifuge and an electrophoresis apparatus being among the up-to-date tools available. The stores carry sufficient glassware, chemicals and replacements to ensure that work is not held up until spares arrive from overseas. The institute's own instrument workshops have made a large amount of special equipment and are well tooled. The large reference library is kept up to date with publica-

tions of technical value from overseas.

The main investigations in the institute's wide-ranging current work deal with plastics and fermentation processes, using the castor plant for new plastics and continuing Dr. Weizmann's work on the fermentation of plant materials. Work is going forward on the chemistry of proteins and protein foods, cancer producing (and healing) substances, water-soluble polymers, heavy isotopes for organic and biochemical work and many other problems which are considered of importance to the economy of the young State.

Training

Israel trains its scientists mainly at the Hebrew University in Jerusalem which is of the size of an English provincial university. Many of its buildings are now on Arab territory (Mount Scopus) so that the chemistry and physics departments have to work under severe difficulties and with rather inadequate equipment. In spite of these obstacles the standard of work is high, enabling students to gain M.Sc. and Ph.D. degrees.

There can be no doubt that the Government of Israel fully recognises the importance of scientific research and development. It has set up a scientific research council working as part of the Prime Minister's department. Its main aim is to co-ordinate scientific and development work, to finance research projects of value to the country and to assist industrial undertakings which cannot afford their own research and development staff.

Israel has now a comparatively large number of qualified chemists having mainly Continental degrees and experience. There has also been recently an influx of American and English scientists of good standing. The number of locally qualified chemists is also growing, but the demand, especially in certain branches, still exceeds the supply.

The level of industry as such is, as a whole, well behind that of the technical institutions. Many manufacturers have started on a small scale and have not been able properly to plan their processes and production when expanding. Many firms have acquired sites to put up entirely new plants, which in most instances will permit the employment of up-to-date plant and processes.

The chemical industry is still in its infancy, but it is the aim eventually to be as self-sufficient as possible. A large range of chemicals and pharmaceuticals is produced even now, as the following list.

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representing only those available for export, indicates:—

Chemicals Synthetic resins, dehydrated castor oil, cold glue, chemicals for the textile and leather industry, household detergents, cleansing compounds, insecticides (agricultural and household), printing inks, polish (boot and metal), protective sprays for citriculture and live stock (against tick worm and parasites)

Paints and varnishes: Building paints, furniture paints, mirror back paints, asphalt and bitumen varnishes, rustproof paints, industrial paints, dyestuffs for leather industry, metal paints and anti-corrosive paints

Pharmaceuticals: Sulphonamides, hormones, vitamins anti-allergics, analgesics, anti-spasmodics, diuretics fungicides, ointment bases, antiseptics, laxatives, tinctures, and extracts, cardiatonics, penicillin, olive oil (medical), medicinal herbs

Cosmetics and perfumery: Toilet soaps, laundry soaps, soap flakes, washing powder, shaving cream and sticks, alum stones, shampoos, soapless shampoos, non-alkaline soap, tooth paste and mouth wash, lipsticks and rouge, Eau de Cologne, face creams, face powder, hair preparations, face lotions, talcum powder

Extracts and essences: Pure fruit extracts and essences, essential oils, floral concretes and absolutes, Eau de Cologne and perfumery compositions, water soluble perfumes and perfumes for soap, tobacco and snuff, aromatic chemicals.

ARSENIC POWDER HAZARDS

Protection for French Workers

THE protection of French chemical workers against various industrial hazards was the subject of a special decree which has now been enforced.

The decree particularly names the manufacture of chemicals in which workers are exposed to arsenical powders. Where dry processes are used shops must now be completely separated from other sections of the plant and efficient dust-collecting apparatus must be installed. Their efficiency will be inspected from time to time. Crushing and packing of all products containing arsenical powders must be so arranged that dust does not escape.

All walls of these premises must be washable and the floor must slope to aid the evacuation and collection of arsenical compositions. Floors and walls must be cleaned daily with vacuum cleaners. All handling of dry or wet arsenical compositions with unprotected hands is forbidden and no food may be consumed on the premises.

The installation of douches is obligatory and they must be conveniently located to ensure that every worker must make use of them. The usual overalls, buttoning to the neck, goggles to protect the eyes and caps, are, of course, compulsory. The dangers of arsenical poisoning must be printed and posted up so that all workers can read them. There must be regular medical visits and no workers may be employed without having first passed a medical test.

CANADIAN CHEMICALS' NEW RECORD

Last Year's Production Approached $595 Million

CANADA'S chemical and allied industries achieved a new peacetime record in value of production in 1949, having gained 2.6 per cent over the previous peak in 1948. Preliminary figures released by the Dominion Bureau of Statistics show that the year's value amounted to $594.80 million, compared with $579.8 million in 1948. Last year's figures were exceeded only in the two war years 1943 and 1944, when values were attained of $653.5 million and $730.9 million, respectively. Then shell-filling accounted for a large part of the totals.

Ten of the 14 industries in the chemicals group showed substantial gains in output in 1949 as compared with the previous year. Coal tar distillation rose by 17.7 per cent to $9.5 million, polishes and dressings, 15.1 per cent to $11.6 million; primary plastics, 14.4 per cent to $18.8 million; medicinals, 11.1 per cent to $79.68 million; miscellaneous 8.1 per cent to $87.67 million; compressed gases, 4.7 per cent to $11.8 million; fertilisers, 5.9 per cent to $67.7 million; inks, 5.9 per cent to $8.77 million; heavy chemicals, 2.6 per cent to $72.4 million; and paints and varnishes, 1.7 per cent to $82.6 million. Output from the soaps industry declined 4.9 per cent to $64.2 million; adhesives declined 20.1 per cent to $6.9 million; vegetable oils, 12.4 per cent to $55.8 million; and toilet preparations, 1.6 per cent to $16.8 million.

There were 1001 plants in operation in 1949, with 40,506 employees whose salary and wage payments amounted to $95.78 million, compared with 1026 establishments employing 39,548 persons earning $89.3 million in 1948.

Imports of chemicals and allied products rose by 10 per cent in 1949 to $130.6 million; the gains being mainly in drugs and pharmaceuticals, cellulose plastics, fertilisers and in miscellaneous chemicals. Purchases from the U.S.A. were worth $115 million, or 88 per cent of the total value, and from the United Kingdom amounted to $8.4 million, or 6.5 per cent of the total. Imports from France totalled $1.8 million, Switzerland $1.1 million and Germany $1 million.

Chemical exports declined for the third successive year, the value for 1949 being $70.7 million, compared with $79.8 million in 1948 and $83.8 million in 1947. Fertilisers at $39.4 million accounted for 56 per cent of the total exports. Synthetic resins were next in importance at $4.9 million, sodium compounds $4.2 million, medicinals, including penicillin and streptomycin $3.8 million, acids $2.7 million, calcium compounds $1.9 million and pigments and colours $1.2 million.

Limiting Overseas Patent Rights in India

REVISION of the present Indian Patents Act and re-organisation of the Indian Patents Office are among the important recommendations contained in the final report of the Patents Inquiry Committee appointed by the Government of India in October, 1948.

By its terms of reference, this committee, under the chairmanship of Dr. Bakshi Tek Chand, was to survey and report on the working of the patents system in India; to examine the existing patent legislation and to make recommendations for improving it, particularly in respect of preventing abuse of patent rights; and to examine the working of the Patents Office at Calcutta and suggest improvements.

In August, 1949, the committee submitted an interim report on the measures which it considered necessary to prevent the misuse or abuse of patent rights in India, particularly by foreign concerns which had secured patent rights in industries concerned with food and medicine. These firms, it was alleged, were not manufacturing their products in the country and had been using their monopoly rights to guarantee themselves a market in India free from competition and were thus in a position to charge very high prices.

The committee recommended that immediate legislation be passed to amend sections 22, 23 and 23A of the Patents and Designs Act. These recommendations were accepted by the Government of India and an amending Bill was introduced in Parliament during the last session and passed as Act 32, 1950.

After examining the views submitted by nearly 400 persons and associations, and certain oral evidence, the committee has now submitted its final report.

France's Vegetable Oils and Fats

Concerted Measures to Enlarge Colonial Yields

THE handling by France of her share of supplies of vegetable oils and fats in conditions of world shortage has been summarised in a recent review by one of the principal authorities, M. Carriere de Belgarric, director of the Institut de Recherches pour les Huiles et Oléagineux, Paris. The principal general aim is to improve both quality and yields of oleaginous crops in Africa. French territories, other than in Africa, are not apparently included in the plans. Attention is specially concentrated on edible oils and fats, e.g., palm oil and karité fat, so that improved methods of bleaching and refining, as well as expression and extraction, are naturally matters of study.

Fertiliser and Oil Mills

Results to date are summarised under the heads of agriculture, technology, and chemistry. Chief place in the agricultural programme is given to the oil-palm, with which results must necessarily be somewhat slow. Although theoretical yields should be three to five tons of oil per hectare (2.47 acres), actual yields at present average two tons. Collaboration in this work has been arranged with similar organisations in the Belgian Congo and in British Malaya since 1947. Valuable information has been obtained in regard to fertilisers and other cultural factors for the oil-palm and other crops.

In technology, the main result has been the approval by the relevant French Government department of the construction of eight oil mills on selected sites in West Africa with a view to replacing the previous deplorable native methods which yield oils with up to 40 per cent acidity, by the best European methods. One mill is to be on the Ivory Coast, four in Dahomey, one in Togoland, and two in the Cameroons. The likely capacity of each is about 4000 tons of oil, with provision for extension.

Many difficulties have retarded completion of this plan, but the first three—Dibombari (2000 tons), Avrankou (4000 tons), Dabou (4000 tons)—are reported to have had their initial trial runs during the first quarter of 1950. It has been decided to use hydraulic presses in the districts where pulp formation in the fruit is adequate, and centrifuges in drier districts where thickness of pericarp is less. The acidity of the palm oil produced at Dabou is down to 4 per cent, and at Drewin, a small experimental plant of 500 tons, 2 per cent.

Special attempts are being made in the Paris laboratories to improve the Velghe type of mixer-washer for oil expression in conjunction with the Pobé station. These include special steam injection, which loosens 60 per cent of the pulp oil, and a further 35 per cent may then be recovered by washing with hot water. It is claimed that the latter is much more easily decanted than by the ordinary Velghe system, and it is hoped by this method eventually to exceed a 90 per cent oil recovery. The method, which is the subject of a recent patent application, is expected to eliminate the need for the most costly part of an oil mill plant.

Linseed Oil Programme

FRANCE'S attempts since the war to obtain adequate supplies of linseed oil at economic prices, as well as oilcake required by her farmers and stockbreeders, appear to have been fraught with difficulties comparable to those of Great Britain and other countries in the same field.

Her mission to the Argentine, headed by M. Pierre Lebon, president of the French linseed oil pool, was unable to accept the onerous conditions and high prices required by the Argentine government. (It is interesting to note in this connection that Britain is obtaining from the Argentine 80,000 tons of linseed oil at £108 for July delivery, also 150,000 tons of oilcake).

Attempts were made to see what could be done in the French overseas territories, states *Oléagineux* (1950, 5 (6) 354-8). It was preferred, of course, to obtain the seed and not oil, as there is plenty of oil-milling capacity in France not too fully occupied. Some progress has been made in Morocco, where the 1949 harvest yielded only 100,000 tons of seed—instead of the 150,000 tons expected—owing to floods in May and June last year. So far, in 30 months up to December, 1949, some 110,000 tons of seed have been supplied from that source with oil content 10 per cent better than that of Argentine linseed.

From experimental plots in Madagascar cultivation has developed on a fairly large scale in five areas by the use of the most modern mechanised methods.

THE CHANGING S. AMERICAN MARKET

Chemical Production and Research in Brazil

SOME idea of the progress of the Brazilian chemical industry can be gathered from the number of petitions presented at the end of June to register, as "national similars," products which have hitherto been classified as essential imports. In accordance with the law, registration is conditional upon proof that the articles in question are produced in satisfactory conditions as regards quantity, quality and price. Once they have been so registered, public service corporations and others, entitled to exemption from payment of customs duties on material imported for their services, may no longer import these articles without paying full customs charges, and all applications from any source to import such articles are refused under the present system.

Among the many products submitted for registration at the last June meeting of the "Commission for National Similars" were the following: "Penicilina G"—procaine or benzilpenicilinato of procaine; chlorate of calcium; dynamite, special dynamite, gelatine, special gelatine and blasting gelatine, produced by the Duperial Company; hexiclan, based on hexachlorate of benzene; synthetic glues prepared by the Goodyear Company, and phosphates derived from apatites.

At the end of June, the Department of Mineral Production announced that the experiments to extract sulphur directly from pyritic rejects of national coal have been entirely successful. The official statement points out that the discovery is of particular importance to Brazil, since there are no known deposits of sulphur in the country, and the chief obstacle to the complete utilisation of national coal has been the presence of sulphide of iron. Mechanical processes of treating the rejects have yielded a relatively pure concentrate, containing from 43 to 49 per cent of sulphur with less than 5 per cent of carbon.

This concentrate could be used by the sulphuric acid factories, but lack of transport facilities from the mines would render the cost prohibitive in consuming centres. The Department of Mineral Production has been assisted by Dr. Paul Kubelka, late Professor of Prague University, in the experiments, and the process is now to be patented. The next step will be to obtain Government credits for further research, so that the method can be applied economically for industrial use. By this method the south Brazilian mines, even with the present low output of two million tons annually, should yield 50,000 tons of sulphur, and the refuse will be sold at good prices.

* * *

Two companies, founded in 1949, the Orquima in San Paulo, and Oximetal in Niteroi, State of Rio de Janeiro, are now treating monazite sands chemically, producing chlorite and sulphate of cerium, which is being exported to Europe. Monazite has hitherto been shipped in the natural state, and since 1942, in accordance with the Washington Agreements, has been shipped exclusively to the U.S.A. The price per ton was fixed at $200 in 1949 and at $250 this year. Now, the primary salts produced in Brazil yield $1200, while the residue of thorium remains in the country, and the phosphorus, recovered in the form of sodium phosphate, is being transformed into products which, until recently, had to be imported. Experiments are being carried out this year to produce metallic cerium for metallurgy.

A third enterprise, the Fomil, a subsidiary of the Lindsay Light & Chemical Company, of Chicago, has acquired the monazite deposits of the Atlantica, an off-shoot of E. I. Du Pont de Nemours, which, during the war and until 1947, prospected the more important beds on the coast of Rio de Janeiro, Espirito Santo and Bahia. The reserves here are estimated at 3.5 million tons, comprising 2 million tons of ilmenite, 600,000 tons of zirconite, and 150,000 tons of monazite. Fomil has submitted a project to the Government, undertaking to industrialise rare earths on condition that Brazil prohibits exports of monazite in the natural state. This enters the U.S.A. free of duties, whereas the derived salts pay 35 per cent *ad valorem*.

* * *

The Companhia de Anilinas, Produtos Quimicos e Material Tecnico, which was founded in 1946, enlarged its installations at Rio de Janeiro in 1949 and is now opening a branch at Belo Horizonte, in Minas Geraes. It had a profit equivalent to £49,768 in 1949.

NEW PROJECTS IN CEYLON

Plant and Technology from Britain

MAJOR L. H. MANDERSTAM, of the London chemical engineering consultant firm of L. H. Manderstam & Partners, Ltd., is at present in Colombo for talks with the Ceylon Government in connection with the implementation of the industrial programme in its six-year plan. He is accompanied by Dr. Hugo Schaefer, who is internationally known as an expert in the manufacture of nitrogen-containing fertilisers. Mr. P. H. Wilson, a senior partner in the Manderstam company, expects shortly to leave for Ceylon to join the expert mission.

Detailed plans are to be discussed for the establishment of three major industrial projects in Ceylon. One is for the production of low alcohol, for which the plant is expected to cost, when completed, in the region of £1 million. The equipment is being supplied by the United Kingdom, the U.S.A. and Switzerland. The plant, which it is expected will be in full production by early 1952, is to have a capacity of some 300 tons, low alcohol every 24 hours.

Another project is connected with the development of the caustic soda industry. This is expected to entail a total expenditure of about £750,000. The mission is also to advise on the establishment of a factory for the production of nitrogen fertiliser, for which all the necessary raw materials are available in Ceylon.

Major Manderstam has planned also to go to Karachi for consultations with the Government of Pakistan on its chemical industry.

Indian Fertiliser Replacement

AS a result of studies carried out by the Indian Institute of Sugar Technology during the last few years, at Kanpur, a manure claimed to be of very good nutritional value has been produced experimentally. It is made from the waste products of cane sugar factories by mixing press mud and cane trash in the ratio of 1:3, and then decomposing for a few months. It is said that this gives a product containing over 1.5 per cent of available nitrogen, in addition to large proportions of potash and phosphates. The cost of production is estimated to be as low as A2 per lb. of nitrogen. The sugar factories of the Union of India produce about 9.4 million maunds of press mud annually, which is expected to give 12 million maunds of compost.

SIX MONTHS' STEEL RECORD

Rate of 16·2 m. Tons in June

A NEW record for a six-monthly period of production was established by the steel industry in the first half of this year when a total of 8,309,000 tons of steel was produced. This was an increase of 351,000 tons over the previous six-monthly record which was set up in 1949.

Output in June was also a record for the month, being at an annual rate of 16.249 million tons compared with the previous best of 15.645 million tons in the same month last year.

Pig-iron in June also showed an increase to an annual rate of 9.474 million tons against 9.664 million tons in June, 1949.

Output comparisons issued by the British Iron and Steel Federation are as follows:

STEEL INGOTS AND CASTINGS
(Thousands of tons)

	1950		1949	
	Weekly average	Annual rate	Weekly average	Annual rate
May	319 2	16,597	315 6	16,409
June	312.5	16,249	300.9	15,645
First Half year ...	319.6	15,619	305.7	15,897

Young Research Laboratory Opened

THE new Young Laboratory at the Royal Technical College, Glasgow, was formally opened last week by Sir William Fraser, chairman of the Anglo-Iranian Oil Co., Ltd., and a former student of the college. Built in the new extension to the college, the laboratory was given added interest by a display of personal records, notebooks and papers belonging to Dr. James Young, patent holder of the refining process on which much of the ultimate oil refining practice developed. The new laboratory will be used for a number of advanced research projects and incorporates some of the most modern equipment. Its work will include silicosis and dust research, infra-red work, high vacuum technology and mass transfer work.

In some cases the equipment has been completed to the college's own designs and research needs. The pyrolysis section has a vapour phase reactor unit in use while in the infra red spectrometry laboratory there are installed a photoelectric colorimeter and monomolecular film balance. The mass transfer laboratory has a unit which is the gift of the Anglo-Iranian Oil Co., Ltd. In this section there is a rotary gas washer. The dust investigation laboratory has a photoelectric dust sedimentation apparatus made in the college workshop among its equipment.

Technical Publications

DETECTION of carbon monoxide is the subject of Leaflet No. 7, originally published by HMSO in 1939 and now brought up to date (June, 1950). A new method involving the use of potassium pallado-sulphite impregnated on silica gel—which was developed during the war—has been added. This method is substantially the same as that previously described in THE CHEMICAL AGE (*60*,

PRACTICAL application of high strength cast iron is the subject of the leading article in " The Nickel Bulletin " (Vol. 23, No.5) now available from the Mond Nickel Co., Ltd., London. How the severe service conditions required for operation of a new automatic loom for the textile industry have been met by the use of acicular cast iron is described. Problems of industrial finishing dealing with electro-polishing, enamelling and nickel plating are included in the usual wide selection of abstracts.

AIR compressors and heaters, alkalis, detergents, dust collecting, fume control and recovery plant, water softeners. laboratory equipment and all types of laundry requisites as well as chemicals and dyes are included in the comprehensive survey of the ninth edition of the Laundries and Laundry Requisites Directory, 1950 (5s). published by the Anglo-Scottish Press, Ltd., London. The work contains information about new plant, equipment and supplies of all kinds.

FURTHER aspects of the therapeutic value of quinine salts are treated in the current publication of the London Cinchona Bureau, "Relief of Night Cramps by Quinine." This deals with the use of quinine from the clinical standpoint.

PURIFICATION of kaolin by electro-osmotic methods is the subject of a long review by S. R. Arras in the May issue of *ION*. Industrial applications beginning with pioneer work of Count von Schwerin and the erection of works in Europe and the U.S.A. are described. Electro-dehydration, the electro-osmotic filter press and electrophoresis apparatus are considered. There are about 100 references, but these are mostly prior to 1925.

METAL statistics are the subject of three new publications, two from the U.S.A. and one from France. Metal Statistics, 1950, is the 43rd annual edition published by the American Metal Market, containing information on ferrous and non-ferrous metals and miscellaneous economic subjects. There is a useful directory of products and their manufacturers. A similar publication, the 29th Year Book of the American Bureau of Metal Statistics, gives an international survey of the production and economics of the principal metals, other than iron and steel, up to and including 1949. Statistiques, published by Minerals et Métaux S.A., Paris, covers the production and consumption of non-ferrous metals since 1939. The main mineral deposits and refineries are indicated in coloured maps, and London commodity quotations from 1913-1949 are given at the end of the volume.

* * *

SODA ash is the subject of an article in the current issue of the "I.C.I. Magazine" in which A. E. J. Gawler describes the development of the great industrial project that has grown up at Lake Magadi, Nairobi, recovering sodium materials from the lake and processing it to the carbonate. The properties, characteristics and varied applications of the new laminated plastic building material are also described and illustrated.

Vapour Pressure Measurement

A NEW precision mechanical instrument for the continuous measurement of low gas and vapour pressures has recently been introduced by W. Edwards & Co. (London), Ltd.

This barometrically compensated capsule dial gauge (Model CG1) is supplied at various pressure ranges from 0-760 mm. Hg. and is accurate within $\pm 2\frac{1}{2}$ per cent of full scale deflection. It has the advantage of being unaffected by barometric changes and has no manometric or sealing liquids or mercury hazards.

Another type of gauge of which production is being begun by this company is the Pirani-type instrument. This is a hot wire type, operating from a battery or the mains with full leak detection facilities. The range of the instrument is 0.5-0.001 mm. Hg., and, of simplified design, it makes precise high vacuum measurement available in many fields from which it was excluded by the cost factor.

The Chemist's Bookshelf

PROGRESS IN CHROMATOGRAPHY 1938-1947. L. Zechmeister. 1950. London: Chapman and Hall, Ltd. Pp. 368. 45s.

Chromatography is rapidly invading many of the fields of chemistry and its literature is becoming bewilderingly extensive. Experimental facts have been accumulating far faster than they can be absorbed into a systematic structure, and new work on the subject is often very largely of a hit-or-miss nature. The need for periodical surveys is thus imperative, as was demonstrated in the Faraday Society's general discussion last September.

This volume is intended to bring up-to-date (to 1947) Zechmeister and Cholnoky's standard treatise. The English translation of the original work which appeared in 1941 is now being reprinted, and this detailed progress report is presented in lieu of a re-editing of the original monograph as likely to be of greater assistance to those interested. It is thus a supplement, but the field has been covered so well that the volume can be regarded as a reasonably self-contained reference work on chromatography. Unfortunately, this otherwise excellent review suffers from the fact that the author has not been able to cover the work of the last three years during which many significant advances have been made, *e.g.*, in the use of paper strips and cellulose columns, in ion exchangers, in inorganic chromatography, in chromatographic theory, etc.

Principles and methods, together with descriptions of newer techniques such as partition chromatography, paper chromatography, Tiselius-Claesson boundary methods, and exchange chromatography, are discussed in the introductory general section (57 pages). The main section (226 pages) is devoted to specific consideration of chlorophyll, porphyrins, bile pigments, synthetic dyestuffs, amino acids, hydrocarbons, alkaloids, vitamins, and many other classes of substances. A final chapter deals with inorganic chromatography.

The information given is almost encyclopaedic, and includes numerous space-saving tables. Concise descriptions of the methods used by various workers and very complete data about adsorption, elution, etc. behaviour are given, with all necessary references to the bibliography (40 pages). There are also comprehensive name and subject indexes.

As the possibilities of chromatography in effecting difficult separations, in identifying trace components, in revealing structure and in general qualitative and quantitative analysis become more widely known its techniques are tending to replace classical methods.—G.S.

POCKET ENCYCLOPÆDIA OF ATOMIC ENERGY. F. Gaynor, 1950, New York. The Philosophical Library Inc. Pp. 204. $7.50.

This book contains a collection of brief notes on the concepts and terms used in the field of nuclear physics, and is claimed to be a comprehensive handbook for all interested in the subject, from the research worker to the "intelligent layman."

The scope is broad. Topics only remotely connected with the subject are included, the idea being, perhaps, to assist the "intelligent layman," rather than the research worker. The inclusion of the simpler physics fundamentals, such as vector quantity, millibar and convection, for instance, shows the author has tried to incorporate most data that might possibly be needed, especially when dealing with the position of nuclear physics in relation to the other sciences. It is arguable, however, that for a pocket encyclopædia a number of such definitions could well have been excluded, if only to reduce the not inconsiderable cost of such a volume. But there is much to be commended within the covers. Mr. Gaynor has treated the statistical aspect with great thoroughness, indicated, for example, by the inclusion of tables of isotopes, packing fractions, orbital electrons and nuclear neutron excess. The definitions and explanations, too, are clear and concise, without ambiguity or tedium, and appear to be up to date.

It can be said that, with the reservations mentioned, this book is a valuable addition to the chemist's reference library, and for some students it may be indispensable, despite the price.—P.M.

HOME

Record Imports in June

Trading figures for June announced last Tuesday, showed that imports were provisionally valued at £238.6 million. Exports totalled £175.9 million in a month of only 25 working days. Adjusted to a standard month of 26 working days the figure would be 182.9 million or slightly higher than the May export total.

Scottish Oil Shale Industry

The prospect of a new and expanding oil shale industry in Lanarkshire, located to the west of the present area being worked for shale, which might serve in the future to offset the diminishing coal production, was held out by Dr. John B. Simpson, of the Geological Survey of Great Britain, speaking last week at the second Oil Shale and Cannel Coal Conference in Glasgow.

Record Cement Production

The cement industry surpassed all records in May with an output of 764,000 tons. This was equivalent to a weekly average of 191,000 tons, of 3000 tons a week more than the previous best set up in April, which was a five-week month. Despite this production, heavy demand reduced stocks at the end of May to 189,000 tons—the lowest level since last November.

Working Party on Weedkillers and Insecticides

The likelihood of legislative action directed to limit the possiblities of human injury in the course of use of insecticides and weedkillers is foreseen in the announcement that the Ministry of Agriculture is to set up a working party to review the entire subject. Official concern was sharpened by the recent deaths of two agricultural spraying operatives after prolonged contamination with a dinitro-ortho-cresol preparation.

Fuel Efficiency Exhibition

The Minister of Fuel, Mr. Philip Noel-Baker, is expected to open the "Fuel Efficiency in Industry and Home" exhibition to be held at the City Hall, Manchester, from November 22 to December 2. Organised by the National Smoke Abatement Society, the exhibition will focus attention on plant and appliances that promote the better and more economical use of fuel of every kind, and is being planned to give full prominence to both the industrial and the domestic aspects. There will also be organised visits, lectures, and film displays.

Sulphate Turpentine Restrictions Removed

The Board of Trade announces that the restrictions on the sale and use of sulphate turpentine have now been removed. Conditions applying to sales of other types of turpentine for use in the manufacture of paints and polishes and for retail sale are unchanged.

Coal Production

The Scottish miners' strike and the commencement of the summer holidays are blamed for the reduction in coal output in Britain last week. Total production of deep-mined coal was 3,736,400 tons, compared with 4,037,000 tons the previous week and 3,756,200 tons in the corresponding week last year.

A New Degreaser for Aluminium

A new aluminium degreaser, claimed to be more efficient than those at present in use, is shortly to be marketed by Jenolite, Ltd. The degreaser is said to be non-inflammable and does not attack rubber, and it will not injure even polished aluminium surfaces. It is expected that the degreaser will find wide use in the aircraft and magnesium alloy industries.

Export Licences

The Board of Trade announces changes in export licensing control, taking effect from July 8. Fertilisers exported to the Channel Islands, and nicotine and its salts and preparations to other destinations, are no longer subject to licence. Open licences are available for the export of goods wholly or mainly of aluminium, copper, iron or steel, provided that the declared value per ton exceeds the value of the actual metal content by the following amounts: iron or steel, £16 16s. per ton; aluminium, £150 per ton; copper, £200 per ton; copper alloy, £160 per ton.

World Power Conference

The fourth World Power conference was held in London this week, when some 16,700 delegates from 47 countries assembled under the chairmanship of Sir Harold Hartley. The programme included 156 papers for the technical sessions when discussion included the preparation of solid, liquid and gaseous fuels, water and steam power, internal combustion engines, gas turbines and atomic energy. A message from Princess Elizabeth was read, in which Her Royal Highness referred to new means of utilising nature's stores of energy and to the value of the conference in acting as a pool of knowledge.

· PERSONAL ·

MR. R. MATHER (Skinningrove Iron Co., Ltd.) has succeeded SIR ANDREW MCCANCE (Colvilles, Ltd.) as chairman of the British Iron and Steel Research Association. The latter becomes president in succession to MR. G. H. LATHAM (Whitehead Iron & Steel Co., Ltd.), who has held the office for the last three years. MR. J. MITCHELL (Stewarts & Lloyds, Ltd.) has been elected a new vice-president and PROF. J. H. ANDREW (University of Sheffield) and MR. F. H. SANITER (United Steel Companies, Ltd.) have been co-opted to the council.

A striking tribute to Birmingham University was paid by PROFESSOR M. L. E. OLIPHANT prior to his departure last Monday for Australia. It was destined for very great things, he said, and might easily become the premier university in the country, at any rate in the field of science. They were, for example, just building the world's most powerful equipment for the study of nuclear physics. For some considerable period Birmingham might, therefore, become the pioneer centre of that kind of work.

The following officers have been appointed by the British Non-Ferrous Metals Federation for 1950-51. President and chairman of the executive committee, MR. WILLIAM H. HENMAN (past president is MR. HORACE W. CLARKE); vice-presidents, MR. W. J. TERRY and MR. H. E. JACKSON; treasurer, MR. A. L. JOHNSON. (*Mr. Henman's presidential review of non-ferrous metal affairs is published on page* 80.)

DR. WILLIAM H. WATSON, assistant director of the atomic energy project at Chalk River, an authority on radar, has been appointed head of the physics department at the University of Toronto. He succeeds PROFESSOR E. C. BULLARD, who returned to England early this year.

MR. A. GEOFFREY COLLINGS, London industrial chemist, has been selected by Pudsey Division Labour Party as their prospective candidate at the next General Election. Mr. Collings was beaten by the Conservative candidate by 64 votes at the last election.

MR. PETER REID, of Euxton Hall, Chorley, a former director of the Bleachers' Association, left £880,986, net £875,867.

DR. WALTER MEITNER, manager of Fashion Printers, has been elected a fellow of the Textile Institute. For many years he has been engaged in research and practical work on textile processing, having contributed substantially to the theory of dyeing. Also elected to membership of the institute are two new associates: MR. J. W. DRIVER, assistant to weaving manager, Carr Manufacturing Co., and MR. R. W. ROBERTSON, works chemist, Nith Dyeing & Finishing Co., Dumfries.

MR. R. J. PINDER, assistant general sales manager of Anglo-American Oil Co., Ltd., since 1945, has been appointed deputy general sales manager. MR. G. W. POWELL, who since 1939 has been divisional manager of the south western division, with headquarters at Bristol, has come to London as assistant general sales manager.

MR. ARTHUR C. HOWDEN has just retired from Hunt Bros. (Castleford), Ltd., chemical manufacturers, after 56 years' unbroken service. He rose to be sales manager, having started in 1894 at the age of 12 as an office boy at 4s. a week.

Students in Industry

AN industrial training scheme, believed to be the only one of its type working in this country, is again to be used by the Royal Technical College, Glasgow, this year to give final year students an insight of industry's methods and objectives. Students who have shown ability will spend a fortnight with leading industrial firms. A further development made possible by the collaboration of I.C.I., Ltd., will permit all final year students to receive a six-week or seven-week "Clinical experience," similar to that employed by the Massachusetts Institute of Technology.

The Ardeer factory of I.C.I., Ltd., has been made available by the directors and Dr. J. W. M'David, research director of I.C.I., Ltd., will supervise the experiment, both as an I.C.I. executive and as a governor of the college. Besides giving students valuable practical experience of industry, the innovation will help to develop still further the liaison between the college and industry, which has been advocated and encouraged during the past few years.

OVERSEAS

Duralumin Production in Jugoslavia

The aluminium plant at Lozovac, Jugoslavia, is reported to have commenced production of an alloy of the duralumin type.

Industrial Acids for Morocco

Reports from Morocco state that the Sté. Chérifienne d'Engrais et de Produits Chimiques is now able to supply all the acids needed in local industry and that superphosphate production is also almost sufficient to meet the country's needs. Sulphuric acid production now amounts to 110 tons daily.

New Source of Paper Pulp

The Indian Forest Research Institute at Dehra Dun states that investigations of the possibility of using palmyra stems for pulp and paper manufacture show that palmyra pulp is a satisfactory ingredient for medium grades of writing and printing paper. The pulp yield is low but this disadvantage may be offset by the low cost of the material.

Soviet Countries Boycott Achema

It is expected that 5000 visitors will visit the Achema 9 exhibition before it closes on July 16. Applications from countries abroad totalled 22 per cent of those from Germany. While visitors from many European countries, India and the U.S.A. will be numerous, Jugoslavia is the only country of the Balkan group to disregard the U.S.S.R. boycott.

Chemicals in the Saar

The government of the Saar has been informed by French authorities that it will be left free to develop a chemical industry using coal and coal by-products. It is understood that the Saar hopes to produce 50,000 tons of synthetic fuel, particularly motor fuel and oil for diesel engines, for which a plant is planned at Sulzbachtal. It will cost the equivalent of £1.5 million and require two years to instal.

International Control of Narcotics

International discussion of the growth of illicit traffic in narcotic drugs and methods of control are to take place in Geneva next month. Representatives of the principal opium-producing countries—India, Iran, Jugoslavia, Russia and Turkey have been invited, as well as the principal drug-manufacturing countries which are members of the United Nations Narcotic Drugs Commission. The intention is to replace the present complex series of international agreements on the control of narcotics by one comprehensive convention.

Holland Ends Control of Chemicals

Control of chemical products, including bandages, has been terminated, with effect from May 31, by the liquidation of the Rijksbureau voor Chemische Producten. Bones represent one of the few items still controlled by legislation in Holland.

Mexican Oil Exports

Continued increases in Mexico's oil output made it possible for the Government-owned Petroleos Mexicanos to export five million barrels of oil, valued at $6.5 million, in the first quarter of this year. These exports were considerably higher than those of recent years.

Oil and Copra Exports Resumed

The Government of Ceylon has revoked its ban on the export of coconut products. All such products, other than fresh coconuts, may now be exported without licence. The export of fresh coconuts will continue to be governed by the existing licensing procedure. An export duty of Rs.300 per ton on copra is retained.

U.S. Research Generator

The installation of a 2 million-volt Van de Graaff generator is reported by the Brookhaven Laboratory, New York. The generator will probably be used to study the effect of electron radiation on aqueous solutions of simple compounds, such as iodides and hydrogen peroxide, with a view to discovering more about the nature of molecular disintegration.

New Swedish Pig-Iron Process

The Bergslaget Research Institute at Domnarvet, Sweden, is reported to have developed a new process for the elimination of sulphur from pig-iron. The pig-iron is put into a furnace revolving at great speed and is purged of sulphur by the addition of powdered limestone mixed with coke. It is stated that the sulphur content is reduced from 0.1 per cent within 10 minutes.

Magnesium Oxide in Norway

A subsidiary of Norske Hydro, the H.E.F.A., has announced its intention to start the production of magnesium oxide next summer. The initial annual capacity is expected to be about 9000 tons, possibly increasing to 18,000 tons later. The raw materials to be used are sea water and chalk, or dolomite. Dolomite, which is widespread in Norway, has been found to be superior to chalk powder for precipitating magnesium hydroxide from sea water in this type of process.

The Stock and Chemical Markets

APART from a further modest rally in British Funds, markets have remained quiet, under the influence of the Korean hostilities, and there has been very little business in most sections. The rising trend in commodity and metal prices has reacted only slightly on share prices. Tin has advanced by nearly £40 per ton during the past fortnight, but company shares have hardly responded. Rubber shares have remained extremely quiet now that part of last week's rise in commodity price has been lost, the present price is 2s. 4d. per lb., indicative of the reception of the U.S. decision to increase production of synthetic rubber.

Chemical shares have again shown movements of only a few pence. Imperial Chemical, at 40s. 4½d., lost part of an earlier small improvement, and Albright & Wilson, at 28s. 6d., were hardly affected by City reports that the company may be planning before long to make an issue of £1 million, either in preference shares or debentures in which shareholders would, no doubt, have preferential terms of allotment. Nevertheless, it is realised that decisions to make new issues during the next few weeks will depend on general market trends. The market is also assuming that Lever & Unilever may require as much as £15 million more capital this year, partly because of rising costs, and larger stocks to be financed because of the forthcoming lifting of soap rationing. Lever & Unilever, at 40s., were lower, with Lever N.V. at 39s. 6d. Brotherton 10s. shares continued to hold their rise to 20s.; Amber Chemical 2s. shares were 8s. 3d.; F. W. Berk 2s. 6d. shares, 15s. 6d.; and Boake Roberts 5s., shares 26s. Monsanto are firm at 49s. 6d., with Fisons little changed at 25s. 9d.; Bowman Chemical 4s. shares, 5s. 3d.; Pest Control 5s. shares, 7s. 6d.; L. B. Holliday 4½ per cent preference 19s. 6d.; British Chemical & Biologicals 4 per cent preference 5s. 3d.; Sanitas Trust 10s. shares were quoted at 15s. 9d.

Borax Consolidated deferred held at 55s., British Glues 4s. shares kept firm at 21s. 9d., and fair business was reported around 47s. in Glaxo Laboratories, while expectations of good results kept the 4s. units of the Distillers Co. steady around 18s. The latter yield little more than 4 per cent, on the basis of last year's dividend, but it is assumed that, in due course, there will be a more liberal dividend policy and that, because of the company's diverse and progressive interests, profits during the next few years probably have scope for further good expansion.

Iron and steels were helped by over-subscription of the John Summers debenture issue and by the premium of up to 30s. established in initial dealings. There is the likelihood that other big steel companies may also make issues of debentures at slightly under par, with the right of redemption at par in the event of nationalisation. It is pointed out that this is cheaper than relying on bank loans to finance expansion and development plans.

United Molasses at 41s. 10½d. were little changed, Turner & Newall at 81s. 9d., and United Glass Bottle kept firm at 75s., although Triplex Glass, at 22s., were inclined to ease. Beechams deferred at 18s. lost the rise which followed the announcement that the dividend on these 1s. shares is being restored to 40s per cent. Oils were uncertain, with Anglo-Iranian lower at £6¼, and Shell at 63s. 1½d.

Market Reports

HOME trade on the industrial chemicals market has been well maintained and delivery specifications are well up to schedule. The volume of inquiry for export has also been good. Most items in the soda products section are being taken up in good quantities and the potash chemicals remain in steady call at firm rates. British Industrial Solvents, Ltd., have announced that as from July 1 the price of butyl acetate has been reduced by £5 per ton. Carbon tetrachloride is now quoted at £59 10s. per ton—an increase of £2 per ton. Fairly steady trading conditions continue to prevail on the coal tar products market. A good call is reported for the light distillates and pitch is receiving a fair amount of attention both on home and export account. The basic price of phenol is now 1s. per lb.

MANCHESTER.—Deliveries of heavy chemical products to the textile bleaching, dyeing and finishing trades have been adversely affected during the past week by stoppages for annual holidays in a number of Lancashire towns. For the same reason, consumption has also been reduced in other directions. Apart from this purely seasonal influence, trade is proceeding on steady lines. A fair amount of fresh inquiry has been reported for alkalis and other bread-and-butter lines during the

(continued at foot of next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LANKRO CHEMICALS, LTD., Eccles. (M., 5/7/50.) June 18, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on Bentcliffe Works, Salters Lane, Eccles, and offices, laboratories, machinery, fixtures, etc.; also a general charge. *£25,527. August 24, 1949.

Satisfactions

ANGLO-BURMA TIN CO., LTD., London, E.C. (M.S., 15/7/50.) Satisfaction June 14, of debenture stock registered November 15, 1946, to the extent of £20,000.

COAL & SILICA INDUSTRIES, LTD. (formerly FOLLSAIN SYNDICATE (FRANCE), LTD., London, E.C. (M.S., 15/7/50.) Satisfaction June 16, of debenture registered June 4, 1942.

Increase of Capital

The following increase in capital has been announced:—DALMAS, LTD., from £75,000 to £150,000.

New Registrations

Activated Carbons & Chemicals, Ltd.

Private company. (27,786.) Capital £5000. Chemical manufacturers, millers, grinders, etc. Directors: J. S. Young, and Mrs. E. B. Young. Reg. office: 257 Eglinton Street, Glasgow.

Associated Descalers, Ltd.

Private company. (484,004.) Capital £2000. Chemical and mechanical descalers, cleaners and repairers of boilers, furnaces, tubes, etc. Subscribers: S. E. Harrison, F. Aldred, T. H. Piper, and G. R. Wyatt. Reg. office: Mill Lane, Longcauseway, Farnworth, Lancs.

C. F. Charles & Company, Ltd.

Private company. (484,036.) Capital £1000. Chemical manufacturers. Directors: C. J. H. Haynes, K. M. Haynes. Reg. office: 670 High Road, Tottenham, N.17.

E. M. Jacob & Co., Ltd.

Private company. (483,853). Capital £10,000. Manufacturers and producers of metals and metallic substances, ores, residues, scrap and the products, chemicals, fertilisers, etc. Subscribers: Ernest M. Jacob and Julius Loewinstein. Reg. office: 79 Bishopsgate, E.C.2.

Lloyd's Soapless Detergents, Ltd.

Private company. (484,140.) Capital £100. Manufacturers of soaps, soap and bleaching powders, washing materials, etc. Directors: L. Pugh, D. G. R. Freeman. Reg. office: Station Road, Tenterden, Kent.

Company News

Lewis Berger & Sons, Ltd.

Group accounts of Lewis Berger & Sons, Ltd., show a decline in trading profits for the year ended March 31 of £74,055 to £801,450. The total ordinary dividend is being maintained at 33 per cent with a final payment of 25 per cent. Total sales values by the main operating companies were again substantially higher, although there were reductions in selling prices. There has been another substantial increase in the volume of trading during the early months of this year.

Changed Name

The name of Celands (Export), Ltd., has been changed to C. & R. Landsman, Ltd.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

past few days. Fertiliser materials have been in moderate request, taking the market as a whole, and a fair trade has been done in tar products.

GLASGOW.—Business in general in the heavy chemical markets remains consistently steady apart from a slight falling off in some of the larger requirements of chemicals owing to stocktaking and balance periods at June 30. Export business has been exceptionally good for a week.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2 at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Compositions containing silicon esters or polymers thereof.—W. E. Smith, C. Langrish-Shaw, and H. G. Emblem. Feb. 26 1948. 641,553.

Process for preparing a stable aqueous emulsion of polymerised normally liquid water-insoluble polymerisable compounds and the stable aqueous emulsion resulting from said process.—Shawinigan Resins Corporation. May 2 1947. 641,653.

Preparation of plasticisable elastomeric compositions.—American Cyanamid Co. May 16 1947. 641,600.

Electrolyser, in particular for producing oxygen compounds of chlorine.—Krebs & Co. Akt.-Ges. May 24 1947. 641,556.

Manufacture of an imidazoline.—Ciba, Ltd. July 11 1947. 641,605.

Method for making phenol.—Socony-Vacuum Oil Co., Inc. July 25 1947. 641,662.

Production of alkali cellulose.—American Viscose Corporation. Sept. 3 1947. 641,609.

Separation of iron and titanium compounds from ores containing iron and titanium.—Titan Co. Aktieselskabet. Nov. 13 1947. 641,738.

4-acylamino-1, 8-naphthalimides and their preparation.—General Aniline & Film Corporation. Dec. 11 1947. 641,569.

Manufacture of $\Delta^{20:23}$—21-halogen-choladienes.—Ciba, Ltd. Dec. 12 1947. 641,617.

Manufacture of pregnane derivatives substituted in the 21-position.—Ciba, Ltd. Dec. 13 1947. 641,618.

Manufacture of basic esters.—Wander Akt.-Ges., A. Dec. 15 1947. 641,571.

Manufacture of esters of a, α-diphenyl-propionic acids.—Wander Akt.-Ges., A. Dec. 19 1947. 641,573.

Copolymerisation of ethylene and vinyl chloride.—E. I. Du Pont de Nemours & Co. Jan. 2 1948. 641,679.

Process for producing urea-formaldehyde resins.—Beck, Koller & Co. (England), Ltd. Feb. 12 1948. 641,697.

Manufacture of unpolymerised urea-formaldehyde reaction products.—E. I. Du Pont de Nemours & Co. March 5 1948. 641,703.

Recovery of chlorobenzene—United States Rubber Co. May 14 1948. 641,520.

Desulphurisation of steel.—Mond Nickel Co., Ltd., and W. W. Braidwood. May 19 1949. 641,523.

Froth flotation processes and frothing agents.—National Chemical Products, Ltd., and R. F. Powell. Nov. 14 1945. 641,932.

Production of potassium bitartrate.—Permutit Co., Ltd. Aug. 1 1946. 641,786.

Alkylated thiophene compounds and production thereof.—Texaco Development Corporation. March 3 1947. 641,944.

Production of feed gases for the synthesis of hydrocarbons.—J. C. Arnold (Standard Oil Development Co.). March 17 1947. 641,945.

Nitriles and process of making same.—Sun Chemical Corporation. May 21 1947. 641,955.

Process of producing alkali and alkaline earth metals.—G. & W. H. Corson, Inc. May 23 1947. 642,034.

Process for the production of metal oxides.—Saurefabrik Schweizerhall. June 2 1947. 641,801.

Electrolysers having soluble anodes—H. Lawarree. June 24 1947. 641,960.

Viscosimeters.—K-C-M Co. July 17 1947. 641,966.

Process for burning lime.—Standard Oil Development Co. July 22 1947. 642,036.

Method of removing iron from ceramic raw materials.—American Optical Co. Aug. 6 1947. 641,971.

Detergent compositions.—Deodor-X Co. of England, Ltd., P. J. Hooper and R. A. Chandler. Aug. 20 1948. 641,902.

Production of artificial articles from polymerisable material.—Imperial Chemical Industries, Ltd., and T. E. Atkinson. Sept. 1 1948. 641,903.

Apparatus for determining the constituent proportions of a gaseous mixture.—Manufactures de Produits Chimiques du Nord Etablissements Kuhlmann. Sept. 4 1947. 641,978.

Method of purifying liquids.—Naamlooze Vennootschap Algemeene Norit Maatschappij. Dec. 30 1947. 641,992.

Mixed phthalate esters and compositions incorporating them.—Nopco Chemical Co. Jan. 1 1948. 642,039.

Process for the manufacture of organic nitrogen-containing compounds.—Sir I. Heilbron, A. H. Cook and A. L. Levy. Jan. 17 1949. 641,909.

Plastic organic polymer compositions.—Petrocarbon, Ltd., H. Steiner, H. S. Boyd-Barrett, and J. R. Holker. Jan. 27 1949. 641,882.

Manufacture of stable synthetic resins.—Beck, Koller & Co. (England), Ltd. Feb. 5 1948. 642,041.

Process for the recovery of metal ions from solutions.—A.S.P. Chemical Co., Ltd., C. L. Walsh and B. A. Adams. Jan. 20 1949. 641,918.

Partial hydrogenation of unsaturated glyceride oils in solvents.—Procter & Gamble Co. March 25 1948. 642,012.

Isobutylene copolymers.—Standard Oil Development Co. March 25 1948. 642,050.

Process for the manufacture of a acylated sulphonamide, and of its salts.—J. R. Geigy Akt.-Ges. April 2 1948. 642,018.

Process for the manufacture of basic esters.—Roche Products, Ltd., A. L. Morrison and M. Konigstein. March 16 1949. 641,845.

Production of pest control compositions.—Imperial Chemical Industries, Ltd., and H. H. S. Bovingdon. July 22 1949. 642,029.

Apparatus for contacting gases or vapours with liquids.—Imperial Chemical Industries, Ltd., and D. Harvey. July 29 1949. 642,068.

The
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New Fields for Phosphorus

PHOSPHORUS in elemental form has not been regarded as a major industrial chemical. Even in the match industry it had a chequered history. Industry's interest has largely been expressed in terms of phosphates and occasionally other combined forms, and for most processing phosphoric acid or one of the phosphates have usually been considered adequate. This background is rapidly changing, particularly in the United States. Elemental phosphorus rather than phosphoric acid is increasingly playing the key part. The recent news that a phosphorus plant costing £1 million is to be built in Britain (THE CHEMICAL AGE, *63*, 9) and will be the largest in the United Kingdom appears to recognise this development.

The major raw material source of phosphorus and its compounds is mineral rock phosphate, of which there are many large deposits around the world. This is generally a complex form of calcium phosphate into which other elements, notably fluorine, have entered by geological infiltration. To make this material "active" or "chemically convertible," de-fluorination and simplification of the molecular structure are required, and this has largely been achieved by acid treatment, of which the well-known fertiliser process for superphosphate is the foremost example. Alternatives are the high temperature fusion treatments, which have been much less used. Once a simpler calcium phosphate material has been obtained, further refinement can produce soluble phosphates. For fertiliser purposes cruder material containing known proportions of soluble phosphate are sufficient.

Readers of American chemical publications in the past decade might often have supposed that the Tennessee Valley Authority was backing a wild horse in making phosphoric acid by first producing elementary phosphorus in electric furnaces. It was commonly believed that this new path to phosphoric acid was made economically possible only because TVA developments were aided by State funds. This criticism is still made by some other fertiliser producers in America. More significant, however, is the fact that chemical companies in the United States are rapidly adopting the electric furnace method, and the older acid or wet-process methods of converting rock phosphate into phosphoric acid

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s ; single copies, 9d.; post paid, 1s ; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

are losing ground, except perhaps in fertiliser production where low price economics and only rough purity standards prevail. But even in this field it is an open question whether the electric furnace method would not be the best route to higher-analysis phosphatic fertilisers, ammonium phosphate, triple or double superphosphate. Where electric power is cheap and abundant the case for the TVA electric method is attractive.

In 1944 American production of elemental phosphorus was at its wartime peak, about 85,000 tons; two years later it had dropped slightly to 80,000 tons. But a recent estimate for 1949 shows that 116,000 tons had been made, and current U.S. expansion plans show that a plant capacity for making 160,000 tons per year will soon be reached. Previous producers are erecting more furnaces and new producers are entering the market. Elemental phosphorus itself is rarely required as an end-product; most of it is converted into phosphoric acid for the further manufacture of a range of phosphates, while something like 7 per cent of the total tonnage of phosphorus is converted into the pentoxide, oxychloride, chlorides, or sulphides.

New demands for phosphorus compounds in a fairly pure state account for this remarkable expansion. One of the most striking is in soap and detergent manufacture. In the United States at least 18 per cent of the elemental phosphorus now produced is required for conversion into phosphates for soap or detergents. The paradox is that soapless detergents should have made less headway in a soap-rationed country, which Britain has been since 1942, than in the United States. That, however, will probably not continue indefinitely. Some experts believe that eventually the modern detergent will become almost as widely accepted here, and the existence of numerous hard-water areas of Britain lends support to this belief.

Another increasing use of phosphorus chemicals is in the production of plastics and surface coatings, especially for metal surface protection. Phosphate esters are required in substantial amounts as plasticisers for vinyl resins; American expansion in this one use is estimated at 200 per cent since 1946. Phosphates are increasingly used as anti-rust and anti-corrosion coatings. A smaller but possibly significant new use is in the production of the several new organo-phosphorus in-

(*continued on page* 112)

Notes and Comments

German Exports

LITTLE remains in July 1950 to recall the desperate competition for greater goals than the export markets waged not long ago between Britain and Germany and her neighbours. Thankfulness that there is now little to conjure up memories of those war industries beyond the infrequent BIOS final report has not entirely obscured the knowledge that a peaceable Western Germany—which last week welcomed with warm and expert hospitality visitors from all over the world to witness at Frankfurt its advances in chemical engineering—is still potentially formidable. Against the threat represented by the offer of chemicals, plant and technical products at prices lower than this country and most others can quote there can be no collective defence. The price factor, which now seems to have won for the German coal industry the former British trade with Holland, is, however, not the only weapon, nor perhaps the most potent as some observers have noted at the German chemical engineers' exhibition this week. The plant at the ACHEMA is commanding interest not only because of the fruitful inventiveness in using in new ways as structural materials such things as unplasticised PVC, graphite and plated steels. Nearly all these plant items can be supplied without the delays which are coming to be regarded as normal procedure here. The impression is given that German chemical engineers and instrument makers have all the special steels and similar "scarce" materials their industry can use, and no heavy home demand impedes the export drive.

Dangerous Chemicals

THE safe conveyance of potentially dangerous goods is a comparatively neglected problem whose proportions have increased in a more or less direct ratio with the widening of industrial chemical methods. Chemical industry has no monopoly of hazardous substances, but its newer products very often come within that category. The material which "exploded" on a lorry, injuring 14 people at Kensworth, Bedfordshire, last month, Ferrolene, has a flash-point of -20° C. It appears that some of the liquid—which, in its vapour form, mixed with coal gas, provides a very effective flame cutter—escaped from a drum and dropped on the hot exhaust pipe. This and a number of other cases emphasise the need to revise the control regulations covering the transport and special packaging of hazardous products. While there exists a series of provisions covering movement by rail, most of these were formulated about 1900, since when a number of chemical products then only in the laboratory stage, have become familiar commercial materials. Some of these have low flash points and other hazardous properties which call for reconsideration of the safeguards which used to be adequate. As far as road transport in concerned, apart from petroleum products and explosives, no authoritative controls appear to exist to make the carriage of dangerous goods a safer business. Inquiries at the Home Office reveal that "the position is under review."

*p*H Standards

THE recent standard issued by the British Standards Institution (THE CHEMICAL AGE, 62, 909) is designed to agree with that of the U.S. scientists E. R. Smith and R. G. Bates, whose work in this field led them to offer a system which would allow unified and co-ordinated reference methods. For several years the U.S. National Bureau of Standards has issued three materials as reference buffers for adjusting glass electrode *p*H meters to conform as closely as possible with the standard based on the formula—$\log_{10}$aH, where aH is the activity of hydrogen ion in the respective solutions. The interpretation of

pH numbers on the old system is complicated by imperfections in the method, caused by failure of the liquid-junction potential to maintain a constant value when the solution to be measured is replaced by the standard solution. At high dilution and high concentration and in solutions strongly acid or strongly alkaline this leads to serious errors, and the *p*H loses its exact fundamental meaning.

Truer Comparisons

THE values assigned to *p*H by the classical methods of Sorensen have been used for 30 years, but the unit of acidity thus determined is not directly related to chemical equilibrium, and further, scales of concentration are not easily compared by the use of galvanic cells. The choice of a new unit for expressing the degree of acidity of an aqueous solution is influenced by the techniques employed and the nature of the response of physico-chemical phenomena to changes of acidity. The cell most suitable seems to be the hydrogen and silver-silver chloride cell, as it does not suffer from defects arising from a liquid junction. Using this and adopting a value *p*wH which is a definite physical quantity and which retains its significance at all concentrations, a simple practical means of comparing *p*H values is presented.

Aluminium for the East

BECAUSE in this country aluminium has come to rank as a " bread-and-butter " commodity, whose use in the presence of formidible competition from plastics and other contemporaries cannot be expected to double overnight, there is a temptation to overlook the very different prospects which exist in other economies overseas, notably in India and Ceylon. One Scottish group has certainly not been oblivious of the great scope in the latter country for fabricators, in this instance of foil, and the resultant Colombo factory has gained substantial concessions from the local Government in the anticipation that it will ultimately provide linings for all the chests used by the tea and desiccated coconut industries. The U.K., Canada and Sweden may lose some remunerative business if that prospect is confirmed. Moves in the same direction seem imminent in India, where a recent Government estimate concludes that cooking utensils alone require 25,000 tons of aluminium a year. In the hope of becoming independent of outside sources of the metal India has developed import duties and a subsidy system, which are said to have made aluminium goods costly and handicapped the fabricators, without yielding the increased supply of metal optimistically expected.

NEW FIELDS FOR PHOSPHORUS

(*continued from page* 109)

secticides, all of which require phosphorus compounds as initial material for their syntheses. Parathion, for example, has created a new demand for phosphorus pentasulphide. Whether these insecticides will create a substantial and lasting demand remains to be seen. The toxic dangers associated with their use have raised serious doubts about their future expansion. On the whole, it is likely, however, that tighter regulations safeguarding their use will remove these doubts.

It may be doubted whether the British future for phosphorus production will show an expansion as spectacular as that of America. We have no deposits of high grade mineral phosphate but we require large tonnages for soil application. The possibility of rock phosphate imports being restricted can never be entirely dismissed. Fertilisers would then have to be given the major share. Another fundamental for the fuller use of phosphorus chemicals is electric power, which should be abundant and preferably cheap. It is neither in Britain today. Nevertheless, the extremely promising home demand for phosphates and the increasing export opportunity for compounds of phosphorus unavoidably suggests that in this country the industry deserves at least as much encouragement as it has had in recent years in the U.S.A.

GERMAN ENGINEERING ADVANCES

Impressions of the ACHEMA Exhibition

From a SPECIAL CORRESPONDENT

ANTICIPATIONS that ACHEMA IX, the first post-war exhibition by the German Chemical Engineering Society (DECHEMA) would receive larger backing than its 1937 predecessor have been confirmed since the opening in Frankfurt on July 9.

At the last exhibition there were 416 exhibitors; this year's event was the largest, having more than 450 exhibitors. Over 6000 registered visitors and 1200 students visited the exhibition, of whom some 25 per cent were from abroad. A fair number of British delegates were present. The whole exhibition was most attractively arranged and efficiently organised, affording excellent arrangements for the reception and entertainment of foreign visitors.

The exhibitors' stands were grouped in five halls and a sixth served for lectures and discussion groups, the sections covering (1) weighing, filling and packaging machines, (2) measurement and control devices, (3) laboratory equipment, (4) chemical plant and equipment, and (5) materials of construction.

Even in a cursory view of the exhibition it was impossible not to be impressed by the remarkable degree of recovery which has been achieved by this section of the German industry in the space of a few years, particularly remembering that many of the factories were in 1945 little more than heaps of rubble. The fact that most of the firms have spent the last five years in development and reconstruction was reflected in the numerous improvements or points of novelty compared with pre-war designs incorporated in most of the equipment and, although only a few items showed fundamental advances, there were numerous examples of improvements in detail. The general standard of finish was extremely high.

Rapid Delivery

The fact that the general level of business is not so high as in this country helps no doubt to account for the shorter delivery times offered, much shorter than for corresponding British equipment. Prices were not much cheaper, except in a few instances. Another point of advantage the German industry has over British industry is that there is apparently no shortage of special alloy steels. The general trend in chemical plant and equipment is towards smaller and more efficient units.

Another general feature which could not escape notice was the popularity of unplasticised PVC (Vinidur) as a material of construction. Almost all firms producing chemical plant include items of this material in their production programme. The emphasis seems to be on the use of Vinidur as a constructional material rather than as a lining material.

Plastic Filter Equipment

One ingenious exhibit was a filter plate made entirely from Vinidur, comprising a series of stampings held together by transverse Vinidur rods. Filter cloths woven from PVC yarn were also shown. There is also a trend towards standardisation of components and methods of manufacture with a view to reducing production costs.

The exhibition being principally concerned with chemical plant and equipment afforded little scope for the actual producers of chemicals. The few chemical firms who did exhibit were offering mainly laboratory and analytical chemicals and products related to the chemical plant industry, such as plating salts, fluxes, special resins, etc. One cannot, of course, draw any general conclusions regarding the German chemical industry from what was being shown at Frankfurt.

One of the outstanding innovations has been the use of induction heating of chemical vessels with ordinary frequency current. This provides a means of heat transmission at higher temperatures than are normally attainable by existing methods, and is effective between the range of 150-600°C. The performance is limited only by the availability of electric current.

The apparatus exhibited was simple and compact in construction and operated at ordinary frequency and voltage, requiring no frequency changer or transformer. It is suitable for application to most types of apparatus and a special application is for the heating of flowing liquids. The method is claimed to be very reliable and requires very little maintenance; the heat capacity of the assembly is low and very accurate control can be automatically obtained. It is, of course, necessary for

(continued at foot of next page)

British Coal Exports

Holland Turns to Cheaper German Sources

HOLLAND, which has up to now been one of the biggest importers of British coal, is to cut future imports, as British costs cannot compete with other European prices, it was announced on Tuesday.

Holland imported 903,800 tons of British coal last year.

The Dutch Government feels that imports of coal on which subsidy over a certain level has to be paid must cease, and it will grant no more licences for such imports. The National Coal Board considered, however, that the position could be straightened out by discussion and representatives were being sent to The Hague this week.

It had been foreseen that increasing coal production in Western Germany was bound to lead to keener competition for British exports (THE CHEMICAL AGE, 62, 598). Some time ago, the Dutch began purchasing coal from the cheaper German sources. Export prices of coal from Western Germany were lowered last week.

One of the sources of dissatisfaction with the British contract has been the double pricing system of the National Coal Board, foreign purchasers being charged more for coal than the equivalent prices at home. It is known that Denmark has been dissatisfied with this system and hopes to import increasing quantities of coal from West Germany and Poland, but it is thought unlikely that she will follow Holland's lead in eliminating British imports.

A further threat to British coal exports comes from Italy where attempts to replace imported coal by indigenous petroleum and methane gas were reviewed in the Senate last week by Signor Togni, the Minister of Industry. It was reported that 500,000 cubic metres of methane gas were now being produced from 18 wells in the Po Valley. By the end of the year 26 wells would be in operation and it was hoped to reach a daily production of 2 million cubic metres.

Contemaggiore, in the Po Valley, was still the best well for petroleum, producing about 10 tons of crude oil daily. Refining machinery was expected from the U.S.A., which might permit the production of 140,000 tons of Italian petrol annually.

There was evidence of methane with petrol at a deeper level in a number of other parts of Italy, especially in the Abruzzi, in Apulia, near Milan in Lombardy, and near Messina in Sicily.

GERMAN ENGINEERING ADVANCES

(continued from previous page)

the vessel being heated to be of magnetic material or to be plated with a magnetic material.

Another notable development which has its counterpart here is the manufacture of new types of apparatus and components from carbon, graphite and ceramics, rendered mouldable by binding with thermosetting resins.

For certain special purposes, silver-plated steel is given a further plating with gold or gold alloy.

For the first time a 65 per cent ferrosilicon has been used as a plating material. This is applied in the form of small cast plates about 3 in. by 2½ in., which are welded in position inside the vessel. Hexagon-shaped plates are used on spherical surfaces. The channels between the plates are then filled with a suitably resistant cement (THE CHEMICAL AGE, 62, 928).

Unit processes as such were not greatly in evidence, but one very interesting exhibit comprised a new small scale processing unit (three tons per day) for the continuous manufacture of Novolacs and other products, offering a considerable degree of flexibility and simplicity of control at each stage.

Two improved designs of flame spraying guns for plastics were exhibited, claimed to give tough, elastic coatings of polythene even on polished metal surfaces. It is understood that one or both of these will shortly be available in the U.K.

A number of new or improved analytical tools were exhibited and some were also described in lectures. Among the latter were an interference filter for longer wavelengths, a new flame photometer, various devices for continuous gas analysis and a new filter mass for macroscale paper chromatography. Numerous optical instruments of traditional German excellence were also in evidence, and two firms exhibited electron microscopes.

The next Achema Exhibition is scheduled for 1953.

PROGRESS IN CANCER RESEARCH

Growing Contributions by Chemists

DEFINITE, if unspectacular, progress in cancer research was discussed by Sir Ernest Rock Carling when he presented the 27th annual report of the British Empire Cancer Campaign at the House of Lords on July 12.

Of the report itself Sir Ernest Carling said:

" If the public do not find in this number any startling developments in the treatment of cancer, there is no cause for discouragement. We have, in the past few years made very definite progress and have come to a critical moment in cancer history.

" Surgery has made considerable strides in successful operation upon cancer of the oesophagus, the stomach and the rectum. In the most active period of my career they were all sites frequently beyond curative treatment.

" The justifiable excitement produced by the introduction of hormones as treatment for prostatic cancer and its metastases—which was quite unprecedented—has died down with further clinical experience but has started a spate of chemical analysis and synthesis such as has seldom been seen.

" Radiotherapy has advanced so steadily in efficiency, year after year, that a pause was inevitable. It is about to pass from an energy range of so many thousand volts to so many million volts. It is rapidly developing the use of internal radiation.

Atomic Radiation

" We ought to pause, and ask our research workers to elucidate still further what happens when we reach those heights. We all know the radiation from atomic bombs killed. How was that lethal effect caused? It was felt that we had better make sure and there is, in consequence, hardly one of our laboratories that is not striving to make it clear.

" As an extreme example, our high-powered machines are tracing what happens when water is irradiated at high energy. What has that to do with cancer? Well, 90-odd per cent of our tissues is water, and water is essential not only for every process of the body, but also for growth itself, including malignant growth.

" The pause, then, in therapeutic advance is filled to the utmost with essential fundamental research.

" It would be true to say that chemists, physicists, therapists and geneticists all alike are now concerned not only with the most intimate structure of the body cells, but with that of the molecules of which their proteins are composed, and even with the electrons in the peripheral orbits of the atoms that go to make up those complex molecules.

It is to be remembered that some at least of the genes and of viruses are single molecules, and that there is every reason for the immense efforts being put into the study of the chemistry, biochemistry and biophysics of all of the substances to be found in the body, and of their anologues elsewhere discovered in Nature, or compounded in the laboratory. It is also to be noted that the catalogue of references to those bodies which have carcinogenetic action runs into more than 5000 items.

Protons and Mesons

" There is, in this volume, something like a microcosm of the research projects of the macrocosm of science itself. Whether it be in probing the physical and chemical effects of all bands of the radiation spectrum, whether it be exploring the properties of protons, mesons, isotopes, X or γ rays: or those of non-ionising radiation, all are to be found here.

" In physics, it is a part of cancer-research to design and build apparatus of extreme delicacy—of an efficiency, for example, 20 times as sensitive as the Geiger-counter; to utilise the most perfect means of magnification, the phase contrast, the ultra violet, reflecting, and electron microscopes and to adopt cinematography to their further elucidation: to follow up micro-techniques to the point of transferring the nucleus of one cell to the living body of another. Were I chemist enough I could describe the almost nonchalant way in which our researchers fold the long chain aminoacids of the proteins into a compact mass and cross link the members.

" Since the last report, the use of isotopes has greatly extended. Their use has brought to the fore the measures necessary for the safety of both workers and patients. When all radiation was external, safety could largely be ensured by the design of apparatus. When radioactive substances reach the body by inhalation, ingestion or injection through the lungs,

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STANDARDS FOR INDUSTRY

BSI's Increasing Aid to Exporters

THE general recognition that, to-day, standardisation is a function of industry to be discharged by it through an autonomous body, of producers, consumers, professional institutions, research associations and Government departments, was referred to by Mr. Roger Duncalfe, chairman of the general council of the British Standards Institution, in his report to its annual general meeting last week. The work of the BSI, he said, had expanded during the past year in all sections, both nationally and internationally.

The institution had distributed nearly three quarters of a million copies of British standards, many of them volumes of considerable size. It had participated in a number of exhibitions, and the library and and information service had developed substantially. Mr. Duncalfe pointed out that the library now holds copies of about 43,000 oversea standards. He also made reference to the growth in certification marking and to the work of the BSI in connection with securing approval of electrical appliances for export to Canada. During the year a further overseas committee had been set up, this time in Rhodesia, and the recognition of the value of British standards in overseas markets was becoming an increasing aid to exporters.

Sir William Larke, retiring president, calling attention to the valuable work which the BSI had done over so many years, emphasised the need for it to remain an independent body, supported by all sections of industry and government under the direct control of an elected council.

NEW DEGREE COURSES

Changes at Sir John Cass College

FOLLOWING its recent change of title from "Sir John Cass Technical Institute," it is fitting that the Sir John Cass College is to have increased facilities for study during the session beginning in September.

It is expected that war-time damage to the upper floor will be completely repaired for the opening of the new session, and that full re-equipment will by then have been completed. As a result, it will be possible for the college to run courses for the special and general degrees in botany, and for the general degree in zoology; time tables for these courses have already been published.

A further innovation includes the separation of the mathematics and physics section into two departments. An M.Sc. course has been instituted in the mathematics department, with a syllabus of electricity, dynamics and elasticity. The new session will see the last of the finals candidates for special degrees in science under the old regulations.

The continued success of the post-graduate lectures in applied analytical and technological subjects, such as micro-chemical and spectro chemical analysis, and lectures on patents and the law as applied to industry, has encouraged the repetition of last year's lectures on radio-chemical methods of analysis.

Naphthenic Acid Prices to Rise

Shell Chemicals, Ltd., announced this week that the prices of naphthenic acid NA9 and naphthenic acid NA20 are to be increased by £5 per ton and £2 per ton, respectively, as from August 1.

PROGRESS IN CANCER RESEARCH

(*continued from previous page*)

by the stomach or the blood stream, the problem of safety is quite another matter, and one with which the campaign and everybody involved in the treatment of patients must be concerned. It is one which, when every mechanical device to be devised is operating, nevertheless depends finally on a strict ritual of behaviour, and calls for conscientiously observed discipline. The apparatus is being designed; that behaviour can be dictated has been proved by the most strenuous tests in laboratories where the campaign's work is done. The matter is of high import and deserves this lengthy mention: it should be known that these potentially dangerous new methods can be employed with perfect safety.

"A non-medical reader of the report might well say, 'there is evidence of an immense number of substances with the power to produce cancer.' Not all of them are known in nature, but the potentiality for inducing malignancy is there. Yet we don't all die of cancer—not by any means. Must there not then for long ages have been at work inhibitors of their malign action?

"I daresay," concluded Sir Ernest Carling, "that it is in the study of these inhibitor substances that the most rewarding results of research will be found."

THE GROWTH OF SOLVENTS PRODUCTION

More Essentials for Modern Industries

EVIDENCE confirming the magnitude of the role which synthetic organic solvents must continue to play in the manufacturing and export industries is to be found in large recent expansions of productive capacity at Hull and Carshalton. These represent an acceleration by British Industrial Solvents, Ltd., of a continuous policy, which at Hull was initiated some 22 years ago by the parent Distillers Co., Ltd. (THE CHEMICAL AGE, 63, 41). This production of some of the essential solvents and plasticisers has had an important bearing on the modern growth in this country of the cellulose lacquers and plastics industries.

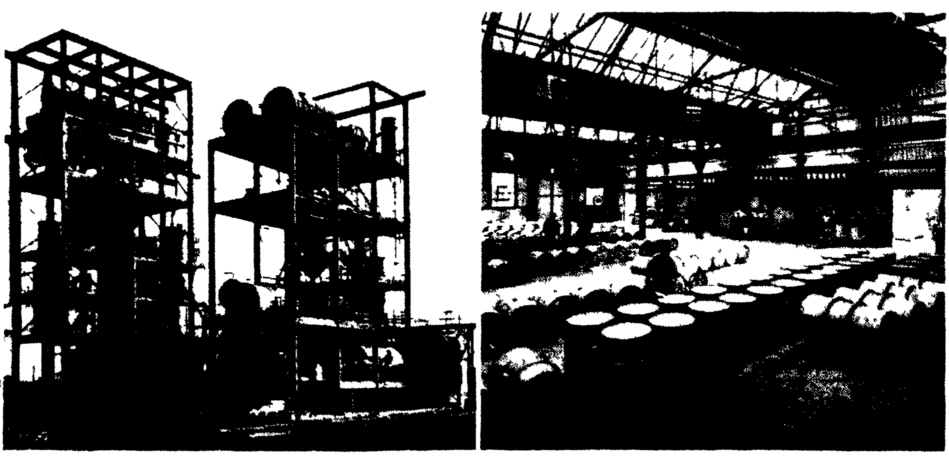
The yield of solvents not previously readily available has been widening, both in bulk and variety, since the acquisition in 1929 of a large Hull ethyl alcohol distillery provided the source for production of acetone, butyl alcohol and acetate. From that enterprise sprang many related developments, providing first acetic anhydride, which has entered largely into the sphere of rayon plastics and pharmaceuticals, and, since the war, the successful use of isopropyl alcohol as an economical substitute for ethyl alcohol in the production of acetone.

Progressive changes since the war, such as the additions of di-ethyl hexyl alcohol and acetoacetanilide, phthalates and other plasticisers, indicate the confidence that the home and export requirements of this class of material are still on an upward trend. Acetates and similar esters are among the groups of which production capacity has been largely increased this year, and increased plant for acetic acid and anhydride and di-ethyl hexyl alcohol is now nearing completion.

The only uncertain factor, the possibility that source materials to sustain the growing output might be overtaxed, may soon be disposed of. That reassurance, intimately affecting an increasingly large number of groups of using industries, is backed by the programme of the associated British Petroleum Chemicals petroleum processing plant, being completed at Grangemouth, Scotland. Among the first materials to be produced in bulk there will be the ethyl and isopropyl alcohols, upon which many of the products of the Hull group depend.

Solvents and Wool Textiles

THE newly published report of the annual general meeting of the Wool Industries Research Association, held at Torridon, Headingley, Leeds, in May, reveals that a joint investigation is being undertaken by the association and Leeds University into the possible uses of solvent processes in the wool textile industry. A memorandum is to be prepared. The importance of strengthening the liaison between the association and Leeds University was stressed.



The new acetates plant and (right) the metering and despatch section at Hull

Parliamentary Topics

TAXATION on weed-killers was the subject of a question by Mr. A. C. Bossom, with particular reference to those having a petroleum ingredient. In reply, Sir Stafford Cripps, Chancellor of the Exchequer, stated that light hydrocarbon oil was subject to Customs Duty at the rate of 1s. 6d. a gallon or Excise Duty at 9d. a gallon, whether used as an ingredient of weed-killer or for other purposes. In the absence of precise details of their composition it was not possible to say what charges would be payable on weed-killers containing other ingredients. Weed-killers were not subject to Purchase Tax.

EXPORTS of copper semi-manufactures from Germany in March 1950 were over eight times the volume they were in 1949, stated Mr. J. Grimston. He asked the President of the Board of Trade what steps were being taken to meet this competition. In a written answer, Mr. Harold Wilson, President of the Board of Trade, agreed that a substantial increase in exports of copper semi-manufactures had occurred in the period, but, in the absence of any evidence of unfair trading practices, he said he had nothing to add to his answer on June 15. (On that date, the Minister said that, as a result of Germany's post war return to industrial production, competition was being encountered, among other items, in semi-fabricated non-ferrous metals. If there was any evidence of German goods being sold by dumping methods, below the cost of production, he would investigate the matter with the German authorities.)

THE creation of an aluminium producing industry in Africa by making use of the Volta river hydro-electric and irrigation scheme in the Gold Coast was the subject of questions by Mr. John Grimston, who reminded the Secretary of State for the Colonies that it was four months since he said that the report would be hastened. Was the Minister aware, asked Mr. Grimston, that the scheme had now been under investigation for three years? Mr. T. F. Cook, Under-Secretary of State for the Colonies, said that there were actually two investigations in progress. The Gold Coast Government expected to receive an interim report shortly, but he could not say precisely when the final report would be received.

DISCHARGE of effluent and sewage in the rivers Dee, Eden, Lune, Ribble, Severn and Tyne was questioned by Mr. J. Grimston. In a written answer, Mr. A. Bevan, Minister of Health, said that enforcement of the Rivers Pollution Prevention Acts was one of the statutory functions of the new river boards now being established. One such board is already operating for the river Severn and others will shortly be set up to cover the other rivers referred to. Until such time, stated the Minister, responsibility rested with local authorities or existing joint boards. He was prepared to assist these authorities to the fullest extent in the reduction of pollution.

REPLYING to Mr. Cyril Osborne, Sir Stafford Cripps said that the exact increases in prices of oil, rubber, tin, lead and wool since devaluation varied according to commodities. That applied especially to oil and wool. The approximate increases in sterling prices since the middle of September 1949 were these: Rubber 170 per cent, tin 24.5 per cent, lead 9 per cent, wool 55-75 per cent, oil and petroleum products 45-50 per cent.

Smokeless Zone in Manchester

THE recommendation that a smokeless zone be established in the centre of the city was made this week by the Manchester health committee to the city council. In the proposed area there are more than 2000 open grates, boilers, kitchen ranges and heating stoves not operated smokelessly, which would render their users liable to fines under the Corporation's Act of 1946. The regional gas and electricity boards have stated that there would be no difficulty in supplying equipment or power to meet the increased demand.

Des Voeux Memorial Lectures

THE summer issue of "Smokeless Air," the journal of the National Smoke Abatement Society, announces that the society is inaugurating an annual Des Voeux Memorial Lecture to commemorate its first president, the late Dr. H. A. Des Voeux, who worked untiringly for a cleaner atmosphere until his death in 1943. The first is to be given at the conference of the society to be held in Margate in September, and will be read by Dr. D. T. A. Townend.

MICROCHEMISTS UNITED IN GRAZ

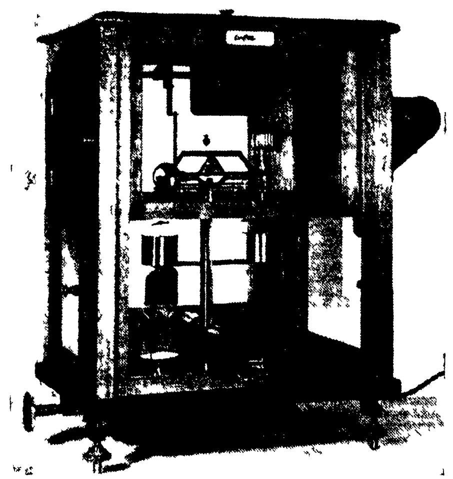
Efforts to Secure Standardisation of Apparatus

From A CORRESPONDENT

THE First International Microchemical Congress,* organised by the Austrian Microchemical Society, held in Graz from July 2-6 attracted well-known analytical chemists from all over the world. Almost 600 members, representing 29 nations, were registered.

To open the programme of the congress, an exhibition of microchemical apparatus and literature was visited on the afternoon of the first day at Studenthaus. This, occupying nearly two floors included apparatus made by all the principal European manufacturers, Austrian, British, French, German and Swiss. British microchemical balances were notably well represented. Among the book exhibits were shown a number of classical microchemical publications.

During the course of this afternoon, and, indeed, throughout the congress, opportunities were given to visit the Pregl Laboratories in the university, and to see the apparatus and methods at present in use there, and early apparatus used by Pregl, which is now of historical importance. A number of the awards and distinctions conferred on Pregl recognising the importance of his contributions to the early development of microchemistry were also displayed.



One of the British contributions to microchemical apparatus shown at Graz, the new aperiodic microchemical balance, with weight loading, providing direct reading of one microgram per division

Many members of the congress were interested to examine the record book, and to find there their own names, inscribed when they received their first training in microchemical methods in Graz.

Later the same afternoon was unveiled a plaque to the memory of Emich, the other recognised doyen of classical microchemistry. This plaque looks eastwards from the Schlossberg over the city of Graz.

In the evening, members of the congress attended a social evening in the Steirerhof Hotel at which they were able to renew old acquaintances and form new ones. The tables being decorated by the flags of all the nations taking part.

At the official first meeting of the congress in the Stephaniensaal on the morning of July 3 members of the congress were welcomed by the president of the congress, Prof. H. Lieb. Representatives of countries then presented addresses of greetings to the Austrian Society, that of Great Britain being read by R. Belcher, of Birmingham University, who attended in his official capacity as chairman of the Microchemistry Group. He also represented the parent body, the Society of Public Analysts and Other Analytical Chemists.

Honorary membership of the Austrian Microchemical Society was conferred on these internationally known microchemists, the citations being made by G. Gorbach; H. K. Alber, of Philadelphia; A. A. Benedetti-Pichler, of New York; and F. Feigl, of Rio de Janeiro (all of whom originally worked in Austria); R. Belcher, of Birmingham; J. Donau, of Graz (for many years a colleague of Emich), C. Duval, of the Sorbonne, and R. Strebinger, of Vienna.

Two Anniversaries

A bronze bust of Emich was unveiled by his daughter, and the proceedings closed with an account by A. A. Benedetti-Pichler of the work of Emich. The 10th anniversary of Emich's death, as well as the 20th anniversary of the death of Pregl, coincide with this congress.

During sessions for the reading and dis-

* The British contributions have already been summarised (THE CHEMICAL AGE, 63, 86.)

cussion of papers, from the afternoon of July 3 till the close of the congress on July 6 nearly 130 papers were presented, in two main divisions: General Microchemistry and Applied Microchemistry. It is noteworthy that about 70 per cent of the papers were presented by microchemists who are not Austrians. Summaries of all these have appeared in the June issue of the Austrian *Chemiker-Zeitung*, and it is anticipated that the papers and discussions will be published in full in the next issue of *Mikrochemie* (Springer-Verlag, Vienna).

British microchemists were well represented by the papers of Dr. G. Hodsman (Developments in Microchemical Balance Design), A. K. Al Mahdi and Dr. C. L. Wilson, of the Queen's University of Belfast (The Separation of Metal-Organic Complexes), R. Belcher and R. Goulden, of Birmingham University (The Determination of Carbon and Hydrogen in Fluorine-Containing Compounds), G. Ingram (Rapid Micro Combustion Methods for the Determination of Elements in Organic Compounds), Dr. R. L. Mitchell, of the Macaulay Institute for Soil Research, Aberdeen (The Spectrographic Determination of Trace Elements in Rocks, Minerals and Soils), and Dr. C. E. Spooner, of the National Coal Board, North West Region (Microchemical Methods Applied to Industrial Materials).

At an unofficial international meeting, whose conclusions were later ratified at the closing meeting of the congress, it was agreed that efforts should be made to hold the Second International Microchemical Congress in 1954. Several possible locations were mentioned, among them Brussels and Milan, but no definite decision was taken.

Towards Standardisation

It was agreed that a small international committee should be formed which should seek the help of the International Standards Organisation at Geneva in collecting and circulating to all countries concerned the work on standardisation of microchemical apparatus which has already taken place, especially in Great Britain and the U.S.A. This committee, consisting of Dr. H. K. Alber (U.S.A.), Mr. R. Belcher (Great Britain) and Dr. G. Gorbach (Austria) will carry out this work as a preliminary step towards the international standardising of microchemical apparatus and methods.

Prof. van Nieuwenburg, of Delft, told the congress that he had been authorised, on behalf of the International Union of Chemistry, to approve the formation of a sub-committee to be concerned with matters of particular importance to microchemists. Dr. M. Zacherl, of Vienna, editor of *Mikrochemie*, was nominated as the chairman of this sub-committee, and in accordance with the practice for committees of the union, he will select the members to serve with him.

A Successful Congress

Apart from the social evening mentioned, receptions and dinners were given to the members by the Burgomaster of Graz and by the Styrian Government. The latter entertainment was preceded by a display of folk-dancing and music, presented in the garden of the Burg, a typical example of the customs of Styria. Another social evening was held at Hilmteich, in the suburbs of Graz, and members of the congress were enabled to attend one of the concerts of the Graz Musical Festival.

The Austrian Microchemical Society is to be warmly congratulated on the success of this first congress and upon the success with which they attacked the task of housing and catering for an attendance much larger than had been anticipated, which severely strained the available facilities. Much credit is due to the organising staff, headed by Dr. H. Malissa, of Graz Technische Hochschule.

International Optical Commission

MEETINGS of the International Optical Commission were held in London in the apartments of the Royal Society on July 17 and 18. The Commission, part of the International Union of Pure and Applied Physics, was constituted at Delft in 1948, after a preparatory meeting in Prague in 1947, to further international scientific relations in the field of optics. The London meeting was the first since the formation of the Commission in Delft, and attracted some 30 representatives from overseas. The president of the Commission was Mr. T. Smith, F.R.S. (Great Britain) and the secretary Professor P. Fleury, of the Institut d'Optique in Paris. The Commission was followed by, and is holding joint meetings with, the London Conference on Optical Instruments at the Imperial College of Science and Technology from July 19 to 26, 1950.

Evans Transport Unit

Evans Medical Supplies, Ltd., has transferred its transport unit to new buildings specially constructed on the company's site at Speke, Liverpool.

NEW PLASTICS SOURCE

Possibilities of Nuclear Fission

THE possibility of new materials for plastics being evolved as the result of the development of atomic power was forecast by Mr. H. V. Potter, chairman of the plastics group, in his address to the annual general meeting of the Society of Chemical Industry at Newcastle-on-Tyne.

He said it was hard to forecast whether many new synthetic products would arise from the methods of nuclear fission employed. There was, however, a chance that the use of this source of energy, which had been mostly confined to its effect on the mineral world and the inorganic atoms, might lead to the development of some highly active bodies.

If atomic energy could be so applied that coal was no longer required for generating power and heat, consumption of coal for gas and coke might fall, then coal could be primarily considered for destructive distillation to secure an entirely new series of organic products from which might come a new supply of raw materials for the chemical industry as a whole.

The need to develop the latent resources of the more backward countries in order to create a new wealth was emphasised by Lord Bruce, former High Commissioner for Australia in London, when he delivered the Messel Medal address to the SCI. It was essential for such countries that they should in future be able to provide for themselves many of the manufactured goods which they used to receive from the older industrial countries.

Two things were necessary to achieve this end, stated Lord Bruce. Scientific, technical and administrative assistance must be provided to the backward areas, and any supplementary external loans granted which they might require in addition to full utilisation of their own financial resources.

Steelworkers Dismissed

TWO hundred steelworkers—the entire staff fo the Dundyvan Ironworks, Coatbridge, Lanarkshire—received dismissal notices along with their holiday pay on July 14, when the works closed down. Only about half a dozen maintenance workers are being retained. The possible date of reopening is unknown.

The dismissals at the Dundyvan works bring the total number of men paid off on the eve of the Glasgow Fair holiday to 400. The other works concerned are the British Tube Works, the Coatbridge Tinplate Works, and the Woodside Ironworks.

WOOL RESEARCH LEVY

Compulsory Contributions Proposed

THE importance of scientific research in the development of the wool industry is recalled by the statement by Mr. Harold Wilson, President of the Board of Trade, that approval of Parliament is being sought for a levy on the industry to help in furthering research work.

Voluntary subscriptions have, up to now, been the mainstay of the wool textile research institutions and laboratories, which together with the textile departments of the universities have carried on very valuable work. Legislation giving a firmer financial background would be welcomed by these associations.

It is being emphasised in the industry, however, that research must not be dictated by any Government department. No objection to the scheme would be raised provided control remains elastic.

One problem of such a levy would be the assessment of individual contributions. The results of research investigations would, of course, be made available to all.

British Plastics Exhibition

THE British Plastics Exhibition and Convention will be held from June 6-16, 1951—within the period of the Festival of Britain. The exhibition, the first of its size and kind, will be held in the National Hall, Olympia, and will be open to the public. The exhibitors will be British and Commonwealth firms who produce, mould or fabricate plastics or supply raw materials or equipment for the plastics industry.

The exhibition and convention are being organised by *British Plastics* in collaboration with the British Plastics Federation, the Plastics Institute and the Plastics and Polymer Group of the Society of Chemical Industry. The convention will be held in an adjoining hall. Sessions will include lectures for technicians in the plastics industry, and afternoon technical lectures for the chemical and consumer industries.

Nylon Plant Fire

Four employees were injured—one of them seriously—as the result of a fire which occurred last week in the nylon polymer plant of Imperial Chemical Industries, Ltd., at Billingham-on-Tees. Only slight damage was caused, and the fire was quickly brought under control by the joint efforts of the Stockton and Billingham Fire Brigade and the I.C.I.'s own works fire service.

MODIFIED PHENOLIC RESINS

Useful Characteristics of Nitrile Rubber

From A CORRESPONDENT

NITRILE rubber is now an important modifying agent for phenol formaldehyde resins and it is of special value for making new moulding compounds possessing improved impact strength and shock resistance.

Some commercial grades of nitrile rubber phenolic moulding powders are characterised by a low modulus of elasticity (0.6×10^6 p.s.i. in tension) which enable them to be used in thin sections around metal inserts. Moulded parts are capable of standing repeated abuse without failure.

Moulding Characteristics

Nitrile rubber phenolic compounds can be injection or compression moulded and their mouldability is generally about the same as that of general purpose grades of powder. Moulded articles have a good surface appearance and are particularly suitable for tool handles and special electrical components which require a combination of good insulating properties and great toughness.

As a result of considerable experimental work carried out in America by B.F. Goodrich Chemical Company, a finely divided nitrile rubber powder is now available to American moulding powder manufacturers. This powder can be readily blended with the phenolic resin and fillers before the mixing operation so that normal phenolic milling operation is not affected. Previously great difficulty was experienced in mixing the granular nitrile rubber with phenolic resins.

The main advantages claimed for nitrile modified phenolics can be summarised in this way:—

1. Moulded articles possess greater impact strength than ordinary shock-resistant mouldings.

2. The resilience of nitrile rubber-phenolic powders enables these materials to be moulded in thin sections around large inserts and around inserts subject to vibration and flexing, without danger of failure in service.

3. Parts moulded from the new compounds do not fail when subject to rapid temperature changes from 40°C. to 120°C.

4. Moulded parts have low density, excellent finish, high gloss on low draw or transfer moulded parts, and an ability to hold self-tapping screws tenaciously.

5. Disadvantages include the need to employ greater care in milling operations and increased cost of the blends, owing to the relatively high price of nitrile rubber.

Apart from its use for modifying the properties of phenolic moulding powders, nitrile rubber is also of great value for making adhesives based on the two compounds. Nitrile rubber is readily compatible with phenolic resins and the two materials are soluble in the solvents of the other. Unlike natural rubber, nitrile rubber is soluble in ketones, which also dissolve phenolics, it is insoluble in saturated aliphatic hydrocarbons. That is the reverse of the characteristics of natural rubber.

Adhesives based on nitrile rubber and phenolic resin blends possess excellent bonding properties and, except for natural rubber, butyl rubber and polythene, they will bond together most materials. The list of suitable materials includes cork, paper, leather board, polyvinyl chloride and vinyl co-polymers, nitrocellulose, cellulose acetate, nylon, urea and phenolic resins, iron, brass, aluminium, wood, etc.

Two Forms

There are two main grades of adhesives consisting essentially of nitrile rubber modified phenolic resins: adhesives made by blending together water dispersions of phenolic resins with nitrile rubber latices; and solvent-type cements produced by dissolving phenolic resins and nitrile rubber in acetone or methyl ethyl ketone. Bonds of excellent strength can be obtained by using these cements and allowing the solvent to evaporate; curing at temperatures of 250°F. greatly improves the heat resistance.

While nitrile rubber is of value for modifying phenolic resins, the reverse is also true. The addition of relatively small amounts of phenolic resins in nitrile rubber results in a very high degree of reinforcement, especially in tear and abrasion resistance. Shoe soles and basket ball covers are examples of rubber parts in which the reinforcing effect of phenolic resins is utilised.

Heat and Power for Petroleum Chemicals

by E. BONWITT and H. E. CHARLTON, A.M.I.Chem.E., M.Inst.F.*

THE Petrochemicals plant will be able to produce a wide range of organic chemicals from 75,000 to 100,000 tons per annum of petroleum naphtha, and it can easily be extended to about double this capacity. Distillation processes at Partington are operated with temperatures and pressures covering a wide range. The materials to be processed differ greatly in boiling point; some are gaseous at ordinary temperatures and some are sensitive to the effect of high temperatures.

Generally the temperature at the point of application of heat in fractionating columns — 150° C.-400° C. — is somewhat higher than the boiling point of the particular chemical being obtained at that pressure. Steam at various pressures is used for heating in the lower temperature ranges, *i.e.*, up to 250° C., and hot oil heating or direct firing has been employed above this temperature. In the sub-zero temperature range, cooling and heating are done by the evaporation and condensation of various refrigerants.

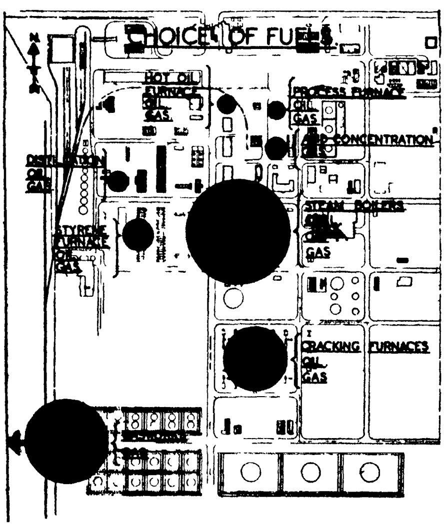
Apart from distillation, heat is required for such purposes as:—

(1) Cracking of naphtha into a mixture of gases and liquid products at about 700°C. (a highly endothermic reaction).

(2) In the manufacture of isopropyl alcohol from propylene considerable quantities of sulphuric acid have to be concentrated from a lower to a higher strength, involving the expenditure of heat.

(3) Many products are very viscous or even solid at ambient temperatures. Tanks, pipelines, pumps and valves dealing with them have to be heated.

(4) Space heating.



Relative requirements of the fuel-consuming units

Ancillary Power

A supply of power (as distinct from heat) is required for the pumping, compressing and mixing of the products, for providing cooling water and compressed air, for lighting and welding and for motor-driven machines in the workshop.

The first choice of fuel for power plants in this country is coal, since its price is stable and no question of foreign currency is involved. For the Petrochemicals plant the decision was not so simple, and oil was chosen in preference to coal.

Coal could have been used only for the steam boilers. Gas and fuel oils are the possible alternative fuels for all purposes in the plant. Fuel gas is available as a by-product from the gas separation plant: it consists of those gases which are not required for chemical synthesis and it has a calorific value of about 1000 B.Th.U./cu. ft. A considerable quantity of this gas is being supplied to the Gas Board for blending with water gas produced in their works at Partington. There is provision for storage in a relatively small fuel gas holder.

There are various plant units which can use either fuel oil or gas. The sulphuric acid concentration plant, being of the submerged combustion type, is limited to the use of gas.

By far the largest fuel consumer is the boiler plant. This is therefore most suitable as a buffer to balance the gas production against the requirements of the gasworks. For boiler firing, gas and the alternative fuel would have to be burnt in all proportions between 0 and 100 per cent gas. But it is impracticable to burn

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100 per cent gas in a coal-fired boiler with grate, and pulverised coal would therefore be essential, necessitating much larger combustion chambers and considerable additional expenditure on dust-collecting plant.

A major disadvantage of the use of coal as a fuel in this particular works is that it would have ruled out the possibility of having a centrally disposed power station. The sidings for bringing the coal to such a station would have occupied a considerable area, and a much larger area than this would have been unusable in view of the proximity of chemical plants which involve the treatment of inflammable materials.

Placing the power station at the periphery of the plant would have increased by hundreds of feet the length of the service pipelines leading from the station, and they would in many cases have had to be of greater diameter to avoid excessive pressure drop. Higher losses in these lines would have added to the operating costs.

Capital Outlay

The capital outlay on the additional equipment for a coal-fired plant would have been very considerable. It would have had to cover the difference in cost between oil storage and pumping arrangements on the one hand, and the much more expensive coal-handling and pulverising plant on the other; it would have had to provide also for the plant for the collection and disposal of ash and dust, for the increased price of boilers with larger combustion chambers and for the additional cost of a much larger building.

Approximate estimates show that the annual costs for amortisation, interest and maintenance of such additional plant for an installed capacity of 170,000 lb./hr. steam would be between £15,000 and £20,000.

The running costs would also be increased by the additional labour and power required and by the fact that the efficiency of a coal-fired station would be about 8 per cent less than that of the oil-fired plant. These items add up to approximately another £12,000 per year.

Taking a broad overall view, it is felt that the decision to use fuel oil was a correct one for this plant.

It is obvious from the temperature ranges covered that steam should be used as the heating medium wherever possible. The lowest steam pressure was fixed at 20 p.s.i., as below this value the steam pipeline diameters and the heating surfaces in the plants would have been excessively large. The condensation temperature of 20 p.s.i. steam covers a number of process heating applications and all the space heating.

The next higher steam pressure had to be sufficient to allow a reasonable pressure drop in engines and pumps exhausting at 20 p.s.i. This set the minimum pressure at about 100 p.s.i.; the final pressure selected was 150 p.s.i., this being the maximum for which standard steam pumps and similar equipment are usually built. The condensation temperature of steam at this pressure is 185°C., which covers a further fair range of process heating requirements. 600 p.s.i., with 250°C. condensing temperature, was the final choice for the next higher steam pressure. Hot oil covers the next range, from 250°C. up to 375°C. Beyond this temperature direct-fired furnaces had to be used.

Hot oil has the following advantages over direct firing: (1) Easier temperature control. (2) Furnaces can be built remote from the danger areas. (8) One furnace can be used for several plants. (4) Local overheating of the products is avoided.

The simplest solution would have been to buy both steam and electricity from the new Carrington power station, less than a mile away, and which it was thought in 1945 would be ready at about the same time as the Petrochemicals plant.

Considerable alterations would, however, have been required to the standard design of the station to enable it to supply low-pressure steam, and the opinion of the Central Electricity Board was that it was not worth while to change their main plans (and thereby delay completion of the station) in order to secure the relatively small amount of steam load which would have been taken by the Petrochemicals plant.

Alternatives

Three alternative systems considered are based on the following four premises: (1) That as a basic requirement steam is needed for heating in the various process plants. (2) That "process steam" includes all steam which is condensed to water, and the total steam so condensed is equal to the steam load of the boiler plant. (8) That all electrical and mechanical energy required for the plant would be generated by back-pressure equipment. (4) That sufficient steam should bypass the various prime movers to allow for load fluctuations.

Scheme 1 assumes a relatively cheap boiler plant operating at 800 p.s.i. pressure and 100 p.s.i. intermediate pressure. This allows about 2000 h.p. to be generated in back-pressure steam engines and

approximately 800 kW in a turbo-alternator. It necessitates the purchase of 1200 kW from the electricity grid and increased fuel oil consumption on hot oil furnaces to cover the heat range between 200° and 250°C. Should additional electrical energy be required for future extensions it would be possible to superimpose a steam plant operating at 1200 p.s.i., and this would give at the present steam consumption about 2000 kW.

Scheme 2 assumes that steam is generated at 600 p.s.i. and that pass-out turbines are used, expanding to 150 p.s.i. and 20 p.s.i. In this way, with the process steam requirements at 150 p.s.i. and 20 p.s.i., the electrical energy which could be generated would be about 3600 kW. All power requirements would then be met from this electrical source.

Scheme 3 is the system which was chosen. Back-pressure turbines working between pressures of 600 p.s.i. and 150 p.s.i. were installed, giving an electric power output of about 2000 kW. An additional 2000 h.p. of mechanical power is obtained by steam engines and pumps working between 150 p.s.i. and 20 p.s.i.

The following are the reasons for the selection of this scheme.

(1) In plants with a variable capacity, steam drive is preferable to electric because of the ease with which the speed can be controlled.

(2) Steam drive, especially for the larger powers, is to be preferred in plants where there is any fire risk from inflammable vapours.

(3) Scheme 2 is far too rigid. A high turbine efficiency can be obtained only with a fixed set of conditions.

Greater Flexibility

(4) Scheme 3 is much more flexible, particularly for plant extensions, as the balance between steam and electrical drive can be maintained by choosing the appropriate prime movers.

(5) Although Scheme 3 involves burning more fuel, less power has to be purchased. In 1946 the additional expense involved in purchasing the 1200 kW required was higher than the cost of fuel for Scheme 3 plus the amortisation and other charges on the extra capital required for this scheme.

It may appear that this heat/power balance is too precarious for a power station which serves such a variety of plants. There are, however, certain controllable factors which allow the balance to be maintained. For example, a number of electrically driven fans, pumps and compressors have steam-driven standby units. Further adjustment between steam and power is possible by increasing or decreasing the intermediate steam pressure, which is normally 150 p.s.i.

The large heat capacity of storage tanks for heavy products is another means of utilising surplus low-pressure steam that may be available at irregular intervals, *i.e.*, during the night hours, when there is an extra lighting load.

Experience has shown that the steam and power requirements of the processes alter in approximately the same proportion, and thus a good balance can be maintained over long periods and over wide ranges of plant capacity. Some 150 p.si.. steam is raised from waste-heat boilers which form part of the cracking furnaces.

Percentage Heat Utilisation

83.37 per cent of the heat in the fuel is utilised, of which 4.53 per cent constitutes electrical energy and 4.15 per cent mechanical energy. 6.49 per cent of the heat is returned in steam condensate, which is used partially as feed water and partially for desuperheating.

Even if at certain periods it proves impossible to maintain such a perfect balance, and more steam is condensed than is required in process plants, the efficiency of power generation will still be much higher than could be achieved by the most efficient condensing power station.

The power plant at Partington is intermediate in size between the public utility power station and the small industrial installations, and so has quite distinct functions. It has been designed to combine the highest possible thermal efficiency for both steam and power generation with limited capital costs. without sacrificing reliability. Its layout has been planned to permit considerable future extensions.

The boilers have been designed to be erected in the open, which saves considerably on building costs. There is nothing unusual in this in the petroleum industry, where most of the equipment is, for reasons either of economy or of safety, erected in the open air. The boilers have a watertight casing of sheet steel on a strong steel framework. This casing serves the dual function of weather protection and support for insulation and refractory brickwork.

All impulse lines, pressure gauges and flow controllers which contain stagnant water, and so could be damaged by frost, are traced with low-voltage heating wires and lagged. It has been found that the surface temperatures of the casing are quite moderate so that the latter can be

treated with either ordinary paint or standard heat-resisting paint.

Radiation losses are very small for this type of boiler with water tubes in the combustion chamber and a low gas exit temperature. The influence of the external temperature on the boiler efficiency is therefore insignificant.

As only the boiler fronts and the instruments are under cover, each boiler requires not more than 12,000 cu. ft. of roofed space. If a building had been erected around the boilers an additional 48,000 cu. ft. would have been required per boiler.

There are three water-tube boilers, each of 56,000 lb./hr. maximum continuous rating. They are of the Foster Wheeler marine type, built by Richardsons, Westgarth & Co., for 625 p.s.i., 415°C., at the stop valve. The combustion chamber is surrounded on three sides and on the roof by steam-raising tubes.

Full Scope for Expansion

The boiler efficiency is over 90 per cent, based on net calorific value of the fuel. Each boiler has five burners with on oil jet in the centre and an annular gas ring, so that gas and oil can be burnt separately or together.

As the boilers are installed in the open there is practically no limitation to the size or type of steam-raising plant which can be installed in the future around the power house. Only those parts of the installation which require weather protection (such as electrical de-oiling plant, instruments, and a number of pumps) are inside the boiler house—the rest are outside, close to the fuel oil tanks. The fuel oil pumping and heating equipment is in the centre of the boiler house. From here a ring main carries fuel oil under 250 p.s.i. pressure to the boilers. A second ring main is arranged to serve future boilers on the opposite side of the building.

This building is only 48 ft. wide and 25 ft. high, and even so it provides for a firing aisle for the future boilers. The ground floor is the operating floor for the boiler attendants; it accommodates in the centre the forced-draught fans, feed pumps and fuel oil pumps, heaters and strainers. Each boiler has its own electrically-driven forced-draught fan. One common steam-driven fan can be connected to any of the three boilers by means of underground ducts and dampers.

There are two electrically-driven and one steam turbine-driven induced-draught fans, with space for another unit. The steam turbine starts automatically when the pressure in the flue rises above a predetermined level.

As the steam and power supplies have to be maintained continuously throughout the year all mains are duplicated or form part of a ring. There are, for instance, two feed water suction lines with connections to each pump, two feed water delivery lines with connections to each boiler, two steam lines to the turbines, two turbine exhaust lines and so on.

Fuel oil and gas lines to the boilers are arranged along the outer wall, together with such services as compressed air (for instruments) and town water, which are operated from a platform above the aisle in the boiler plant house.

All steam-reducing and desuperheating equipment is controlled from a panel at one end of the boiler house. This panel carries all indicating and recording instruments. The air-operated automatic controllers are mounted behind the panel and are connected to the reducing valves and injection nozzles by means of mechanical links. Should compressed air fail or anything else go wrong with the automatic operation, every single point can be controlled by means of a handwheel. This centralised control of steam conditions on the plant has proved to be very valuable.

There are two 2000 kW back-pressure turbines of Brown Boveri design, built by Richardsons, Westgarth & Co. The turbines run at 6000 r.p.m. and contain an impulse wheel and 18 reaction stages. The Mather & Platt 3300-volt salient-pole alternators run at 1500 r.p.m. and are driven through a single-reduction gear.

The main switchboard consists of a number of standard cubicles arranged to present a flush front. The high-voltage cubicles have doors which allow the oil circuit-breakers to be withdrawn from the front.

Control Gear

All control gear is arranged on panels between the high-voltage and low-voltage boards and on a control desk in front of them. From these points, cooling water pumps and their electrically operated valves can be remote controlled and all high-voltage circuit-breakers can be closed or tripped. A mimic diagram with signal lamps indicating the position of breakers and isolators assist the operator.

In a plant of this type it is essential to keep certain pumps and plant working in all circumstances. This applies particularly to the cooling water pumps, which must in no circumstances stop, otherwise a dangerous situation is created. As the Electricity Board could not provide a standby supply of more than 500 kVA, a

standby diesel alternator set of 330 kVA has been installed. Should the main power plant fail, an automatic relay connects the grid supply, via a transformer, to a part of the low-voltage switchboard, whence it is distributed in accordance with an emergency "drill".

Electricity is sent out at 3300 volts to a number of substations arranged at load centres outside flameproof areas. Each substation consists of a 3300/420 volt transformer and the necessary 420 and 240 volt distributing and control gear. High-voltage feeders are laid out radially and have breakers only at the power station end, with push-button trips in the substation.

Of the 1000 electric motors installed at the Petrochemicals works two-thirds are flameproof. Because of the long delivery times quoted for flameproof switchgear, as well as for reasons of safety, it proved more attractive to use remote controlled contactor starters of standard non-flameproof design. They are installed in the substations and are operated by flameproof push-buttons at the motors.

The provision of suitable feed water for high-pressure steam plant is one of the most important problems of an industrial power station where steam is used for process work. In the Petrochemicals plant between 50 and 60 per cent of the generated steam can be economically returned as condensate. 75 per cent of the returned condensate contains cylinder oil, and all condensate is liable to be contaminated in the event of leakage on any of the many heat exchangers. The make-up water, drawn from the Manchester Corporation Water Works, is a very good water, with only 35 p.p.m. total dissolved solids, very little temporary hardness and approximately 20 p.p.m. permanent hardness.

Choice of Feed Water

For the supply of feed water a choice had to be made of four, as follows: (1) 100 per cent chemically treated make-up water. (2) Condensing of turbine steam in a heat exchanger which generates the plant process steam at 150 p.s.i. (steam conversion). (3) Distillation of returned condensate plus chemically treated make-up water. (4) De-oiling of condensate plus chemically treated make-up water.

The first step in removing oil was to provide steam exhaust mains at pump houses with a Vortex-type oil separator. These separators remove the bulk of the oil and keep the heating surfaces of the various steam-using plants reasonably free from oil.

The oil-free condensate returned from steam traps at 150 p.s.i. is collected in the one vessel and steam is flashed into the 20 p.s.i. main. A steam-operated pumping trap delivers this condensate into the oil-free condensate main. The other vessel collects oily condensate and has its independent pumping trap. It is fitted with a safety valve set at 2 p.s.i., which prevents air from getting into the return system and causing corrosion.

Easy Separation of Oil

Only pure mineral oil is used for lubricating purposes throughout the plant. The use of any compounded oil is strictly prohibited.

The first step is a separation by gravity at the temperature of the returning condensate, which is at least 95°C. With mineral oil at this temperature the separation is easy and the effluent contains less than 3 p.p.m. of oil.

The second stage is an electrolytic de-oiling plant. The condensate is made electrically conducting by the addition of a suitable electrolyte and is then passed in zigzag flow over and under mild steel electrode plates contained in wooden tanks. There are 20 plates in each set, the end plates of which are connected to the poles of a 200 volt d.c. supply so that there is 10 volts potential difference between consecutive plates. Ferric hydroxide is formed, which coagulates small oil particles. The effluent passes through anthracite filters and is then crystal clear (approximately 0.3 p.p.m. oil).

The third stage in the de-oiling process is a filtration through a bed of activated carbon. Hydraffin, which is a charcoal prepared specially for the adsorption of oil in water, was chosen. This stage produces little reduction in the oil content, its main purpose being to serve as a final screen in case of failure in the previous stages.

An important problem in such a de-oiling plant is the correct measurement of small quantities of oil. The usual extraction methods break down when one approaches the order of 0.5 p.p.m., because the quantities of oil are too small for correct weighing. Fluorescence could be used as an indicator but would probably not give reliable quantitative results, as not all the oils in question give the same degree of fluorescence.

The following method was therefore developed: A sample in a 30 in. long glass tube is viewed longitudinally with good illumination at the far end, and if the sample contains more oil than 0.2 p.p.m. it shows a definite cloudiness, which

can be compared against prepared samples of various oil contents. The method requires, of course, an absolutely colourless effluent and this is one of the reasons why particular care must be taken in the choice of the electrolyte.

All other treatment of feed water follows conventional lines. Manchester Corporation make-up water is first used as cooling water for oil and air coolers of the turbo-alternators and air compressing plant. Heat recovery from these sources is equivalent to 1 per cent fuel saving. After this the water is heated by continuous-blowdown water and softened in a sodium zeolite plant. Finally it is collected together with clean and de-oiled condensate.

The cracking of naphtha to form olefinic gases and a highly aromatic liquid product takes place in two stages. The first—the breaking down of the molecular structure of the naphtha to form lower hydrocarbons—is a highly endothermic reaction; and the second reaction—to form a fully aromatised liquid—is practically thermo-neutral under isothermal conditions.

Design of Cracking Furnace

The cracking furnace is designed to carry out these reactions in the most effective way. The tubes in which the first reaction is carried out are heated by radiant heat from five down-draught gas or fuel oil burners disposed in such a way as to ensure the most even heat distribution.

The second stage of the process is achieved in the lower part of the combustion chamber. A certain amount of flue gas is recirculated to modify and control the temperatures so that the aromatisation reaction can take place under essentially isothermal conditions. The heat in the flue gas leaving this furnace is used to vapourise the incoming naphtha by convection. Finally, before passing to the chimney the flue gas gives up its heat to waste-heat boilers.

Before it was put into operation, some qualms were felt about the gas flows in this furnace. where recirculated flue gas was injected at right angles to the down flow of gas. It was feared that eddy currents would be set up and so prevent the proper working conditions being achieved. To check this a model was made in Perspex and the gas flows were reproduced by water flowing at the same Reynolds numbers. Coloured inks were injected into the various streams so that the flow of flue gas could be followed visually.*

* Dr. P. O. Rosin's method

A complex mixture of hydrocarbon gases coming from the cracking plant is compressed and cooled to a temperature at which the desirable components such as ethylene are liquefied. The components which remain gaseous are hydrogen and a certain amount of methane. The liquid components are then fractionally distilled at low temperatures to give pure methane, ethylene, ethane and propylene-propane.

Cascade Refrigeration

The low temperatures in the fractionating columns, the lowest being −185°C., are obtained by a cascade system of refrigeration. The ammonia absorption plant (the first step in the refrigeration cascade) consumes a considerable quantity of heat, which is supplied as 150 p.s.i. steam. The ethylene and the methane cycles work on the conventional compression system.

It would have been possible to use the same refrigeration system for ammonia, instead of the absorption type, but for an evaporator temperature of −50°C. the volumes of ammonia which would have had to be compressed would have been so great that the steam consumed by the driving engines from 150 p.s.i. down to condenser pressure would have been considerably greater than the steam required at that pressure in the anhydrous ammonia generators. In addition, the compression system would have cost more, would have taken longer to build. and would have introduced technical difficulties due to the ammonia being compressed from sub-atmospheric pressures.

For this gas-separation plant six compressors of about 500 h.p. each were required, two of these (for cracker gas) being two-stage and the others (for ethylene) being single-stage. Three smaller compressors of about 60-120 h.p. each were needed for methane.

Compressor Alternatives

The choice had to be made between vertical and horizontal machines. The lower-speed horizontal engines have a high thermodynamic efficiency, which is over 60 per cent in this plant, whereas the high vertical engines achieve little over 50 per cent. Another advantage of the horizontal type of machine is that the gas cylinder can be in tandem with the steam cylinder, giving a higher mechanical efficiency.

It was decided to use the vertical type only for methane and to install for cracker gas and ethylene a horizontal type of compressor. These machines develop about 580 h.p. each at 110 r.p.m. and the speed is automatically controlled by the suction gas pressure.

PYRIDINE SYNTHESES

Recent Research on the Homologues

IN the wide field of coal tar chemistry, pyridine and its homologues occupy an important place. One of the leading European researchers in this field, Prof. J. P. Wibaut, of Amsterdam University, recently reviewed the position reached in the study of pyridine, in a paper read before the Society of Industrial Chemisttry.

Prof. Wibaut said that the discovery of pyridine homologues by Brutton and Bailey in 1936, opened up a further line of study. Wibaut and co-workers have lately investigated in detail some of the fractions, especially that of b.p. 129-264°C., and isolated a large number of compounds, including the three methylpyridine isomers, five dimethyl isomers, γ-ethyl pyridine, collidine and other homologues. In the fractions above 180°C., quinoline, isoquinoline, etc., were found. These homologues appear to be in much greater variety in petroleum fractions than in coal tar, and it is difficult to isolate the pure products. Some, however, can be synthesised, as has been shown by Wibaut, Hantzsch and Schering.

Alkyl Pyridines

Schering's method for the preparation of γ-ethyl pyridine did not prove very successful, but Wibaut and Arens claim better results with the alkyl pyridines, obtaining yields of 60 per cent with ethyl pyridine and good yields with propyl, butyl and the isoamyl homologues. When oxidised with permanganate, γ-ethyl pyridine gave a quantitative amount of isonicotinic acid. By applying the method to β-picoline, other pyridine homologues could be obtained. No process is known, however, for the synthesis of pyridine on a commercial scale. Following Berthelot's method for benzene from acetylene, an analagous but unsuccessful attempt has been made to prepare pyridine from a mixture of acetylene and gaseous HCN at a temperature of 600°C., using activated carbon as a catalyst. In the matter of substitutions there are marked differences between benzene and pyridine. For example, in nitration, sulphonation and halogenation. One nucleophile substitution occurs in pyridine which is of great interest. This is the reaction with sodium amide, to form the sodium salt of aminopyridine, which can be readily nitrated or sulphonated. More important is the bromination, studied in detail by the author. The reaction takes place in the gaseous phase, with rigid temperature control and attention to the type of catalyst used. The bromopyridines react with magnesium to form, among other things, several pyridyl-carbinols, with yields up to 60 per cent. Some unstable γ-bromopyridine is also formed during bromination. This reaction with magnesium may also be applied to other halogen pyridines.

Lithium Derivatives

While these magnesium reactions have not yet been fully explained, those corresponding reactions with lithium appear to be more clearly understood. It is possible, using the method of Gilman (U.S.A.), to obtain pyridyl-lithium by reacting the bromopyridines with butyl-lithium in an ether solution at −35°C., and then to react the pyridyl-lithium with cyanpyridine, in similar fashion to the Blaise reaction with arylmagnesium bromide. By hydrolysing the ether solution pyridylketone is obtained, and from this it is possible to prepare the tripyridyl-carbinol.

Further research undertaken, used picoyl-lithium to prepare a series of alkaloids (*punica granatum*), including pelletierine acetal. Dr. Wibaut here made reference to the work of Spielman and co-workers, but it appears that the American researchers were unable to isolate the racemic pelletierine itself, though isopelletierine was synthesised. Generally, it is easier to synthesise these products than to extract them pure from the plant.

Applications to Tobacco

These methods of synthesis have also been applied to the tobacco alkaloids and nicotine compounds, which the author described in some detail, in connection with the work of Spath, Kainrath and Pictet.

Finally, Dr. Wibaut described his research in connection with leucenol of *leucaena glauca B*, found to be identical with mimosine of *mimosa pudica*, which has recently been synthesised by Adams and Johnson in the U.S.A.

The Freezing Point of Uranium

It is reported from the U.S.A. that the National Bureau of Standards has established the freezing point of uranium as 1188° C., plus or minus 2°. The determination was carried out in a protective atmosphere of pure helium.

The Chemist's Bookshelf

INDUSTRIAL CHEMISTRY. E. R. Reigel. 1949. New York, Reinhold Publishing Corporation. London, Chapman & Hall. Pp. 1015. 56s.

This is the fifth edition of a work already well-established as a comprehensive account of the field of industrial chemistry. Professor Riegel has revised the entire treatment in this edition, and has endeavoured to bring the matter as up to date as possible. Because of this enhancement of the usefulness which characterised the previous book, the fifth edition can be regarded as an ambitious and possibly unique attempt to present the entire vista of industrial chemistry, with a good deal of care for the detail and mode of presentation.

That there should be omissions in a work which seeks to comprehend so huge a field in only one moderately sized volume is inevitable and such omissions as come to mind are in the fields most recently developed. For example, fluorocarbon chemistry is not mentioned; neither does the scope of the boron trifluoride derivatives, particularly as catalysts in organic chemistry, find a place in the book. It can be said, however, that the new edition is up to date as far as the more conventional topics of industrial chemistry is concerned; only where unusual or sudden advances have been made does it lag behind. Professor Riegel's account is in fact an excellent summary, very readable and made clear by some good photographs and diagrams. —P.M.

TABLET MAKING. Arthur Little and K. A. Mitchell. 1949. The Northern Publishing Co., Ltd., Liverpool; 15s.

Publications covering the making of tablets are so scanty that the issue of a text-book on the subject excites wide interest. So convenient is the tablet form for the presentation of medicaments that tablet manufacture is one of the fundamental operations in the pharmaceutical trade wherever westernised pharmacy has penetrated. The tablet also offers the advantage of a measured dose of medicament, important enough in respect of medicaments for self-administration, and is essential where the more toxic, ethical drugs are concerned.

While tabletting finds its main application in the medicinal field, the operation is not by any means confined to it. Its use in such cases as the manufacture of bath cubes, powder compacts, fertiliser tablets and home dyeing tablets is well-known. A further important application is in the manufacture of synthetic resin pellets and of powdered metal for powder metallurgy. These extra-pharmaceutical applications, however, receive scant attention from the authors.

This volume covers the whole field in a foreword, 17 chapters and miscellaneous pages; 119 pages in all. It is profusely illustrated, but the reproductions are mainly of the equipment of one manufacturer. This is not a serious defect, since this particular manufacturer dominates the field. One consequence, however, is that the important topics of tablet counting, bottle filling and packaging are dealt with inadequately. Similarly, the topic of air-conditioning in the manufacture of effervescent tablets (Chapter 13) receives little more than passing reference. Wet granulation techniques are extensively covered step-by-step; but the authors are either not familiar with or are disinterested in double compression or "slugging" methods which are cursorily dismissed in some three hundred words. The glossary is trivial and almost irrelevant.

The literature of tablet making and testing is considerable and widely dispersed in British, American and Continental journals. There is, however, not a single reference in the book or any attempt at a bibliography. It appears that the authors speak from practical but circumscribed personal experience and the usefulness of the book, practical as it is, is correspondingly diminished.

An extraordinary situation arises with regard to weight regulation. The authors rightly stress the importance of regulation and explain how tablets "accurate in weight" may be achieved by trial and error methods; but they fail to define their objective. That has been defined in the

seventh addendum to the British Pharmacopoeia, 1932 (" Tabellae," p. 86-88) and in the 1948 volume (pp. 516-519). With the best controlled gestation and delivery, tablets, like babies, will vary in weight round a mean; but in tablet production this weight variation must be confined within narrowly prescribed limits. The authors are of little help in this regard.

Notwithstanding its defects, the book should be widely read. It may even influence some hospital pharmacists to cease preparing those bullets which pass right through the gastro-intestinal tract. They can, if they try, find useful facts about disintegration here—but the index will not help them.—C.G.

CELLULOSE ACETATE PLASTICS. Vivian Stannett. 1950. London: Temple Press, Ltd. Pp. 325. 30s.

In his preface, the author writes that " in spite of the tremendous interest shown in this material, no adequate book existed which embodied the simple facts about this plastic, its properties and techniques of handling." Thus, in a sentence, the scope and limitations of this book are succinctly defined.

It is claimed by the publishers that this book is the first to be devoted solely to cellulose acetate plastics and, this being the case, the book should meet a widespread demand. However, the author, in some instances, appears to have fallen between two stools. For example, in the appendices, he describes in some detail the methods of viscometry used to compare different ingredients. Although he explains that, in order to circumvent the mathematics concerned, only relative values are obtained, it would seem that to describe the measurement of viscosity, without explaining, or even defining, what viscosity is, can hardly be the best way of dealing with the subject. This is especially so here, since the book is intended to reach the average reader.

But it cannot be denied that this is a useful, as well as an attractive, book. The author has endeavoured to present his material in an interesting manner, and for those in the industry it can well be recommended as a comprehensive guide to the subject.—P.M.

New Engineering for Petroleum Chemicals

THE three spherical storage tanks, which have been erected on the site of Shell's new refinery at Stanlow, Ellesmere Port, are the first of this type to be supplied to an oil refinery in Britain. The tanks, designed and manufactured by Whessoe, Ltd., Darlington, measure 35 ft. in diameter and each holds 140,000 gal. of butane gas stored at a working pressure of 70 p.s.i. In the background is the 341 ft. high concrete cooling tower, claimed to be the largest in the world

Technical Publications

AN advanced laboratory apparatus for stirring, mixing and agitation is the new laboratory stirrer, designed by the Kestner Evaporator and Engineering Co., Ltd. This is described in leaflet No. 280. The stirrer, suitable for mounting on a standard retort stand and clamp, has a three-bladed propeller or interchangeable vortex impeller. The speed control regulator is a separate unit so that it can be placed conveniently near to the stirrer but away from fume, splash or heat. A utility model is also supplied which does not incorporate the drop-proof motor cover or special coupling.

* * *

APPLICATIONS of rubber to chemical plant in widely varying rôles are shown in text and illustrations of the current issue of "Torque" (Vol. 1, No. 5), development journal of Silentbloc, Ltd., and the Andre Rubber Co., Ltd., London.

* * *

SHAPING and forming of hot metals necessitates the use of materials that will give long service under arduous conditions. The characteristics of tool steel for this purpose and the effects of alloying elements are discussed by H. Carr, B.Sc. in an article in "Alloy Metals Review" (Vol. 8, No. 56) published by High Speed Steel Alloys, Ltd., Widnes, Lancashire.

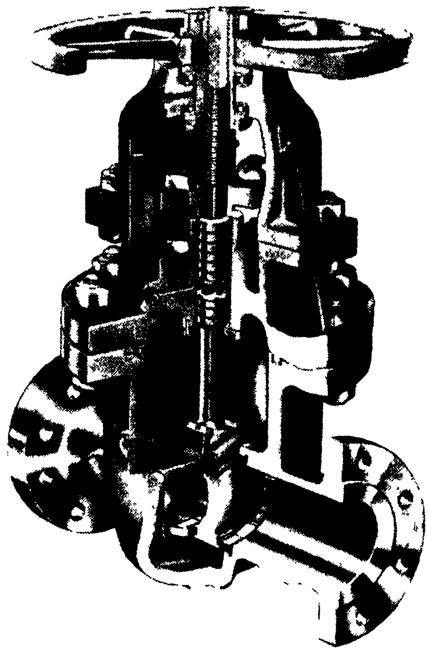
* * *

COMPREHENSIVE information on non-ferrous metals, tables of gauges, metric conversion tables, a ready reckoner and other useful facts are accumulated in the trade handbook of Charles Clifford & Son, Ltd., Birmingham, the tenth edition of which is now obtainable.

VIBRATING equipment for concrete consolidation, for research and experimental work on vibration phenomena, and various forms of solenoids are described by Westool, Ltd., St. Helen's, Auckland, Co. Durham, in its latest leaflets just issued.

* * *

WELDING in all its multiple applications is dealt with both seriously and humorously, with copious illustrations, in the "Stabilizer" (Vol. 18, No. 8) published by the Lincoln Electric Co., Cleveland, Ohio, U.S.A., and Lincoln Electric Co., Ltd., Welwyn Garden City, Herts, England.



[By courtesy of Metalducts, Ltd. Brentford

Example of the new range of outside rising screw valves for the petroleum and chemical industries now being sold under the trade name of Metastream. While satisfying the requirements of BSI 1414: 1949, *head room required for the valve has been reduced to a minimum. The range of valves is, for the present, being limited to within the 6-in. size for pressure ratings up to those permitted by the Series* 600 *standards*

ISOTOPES in industry were the subject of a week-end conference held recently at Birmingham, of which a complete account has been prepared by Mr. D. F. Bracher, secretary of the Atomic Scientists' Association. The first three lectures, "Basic Nuclear Physics" by Mr. W. J. B. Smith; "Methods of Detecting Radiation and Energetic Charged Particles," by Prof. P. B. Moon, and "Electronic Equipment and Counting Technique," by Mr. D. E. Bunyan, are reproduced in the current issue of the *Atomic Scientists' News* (Vol. 8, No. 6).

OVERSEAS CHEMISTRY AND INDUSTRY

NEEDS OF A CHEMICAL INDUSTRY

The Experience of Post-War Germany

TO emphasise the fundamental importance and value of chemical industry in promoting trade and stimulating business activity in other fields of national and international industry is the principal message of the July issue of *Chemische Industrie,* which is a special number of 216 editorial pages and more than 100 advertisement pages, with a complete and detailed "Where to Buy" index.

The generic title of the contents of this issue is "Was ein Chemiebetrieb Braucht" (What a Chemical Works Needs), and its scope is therefore wider than that of the well established theorem that the production of sulphuric acid in any country is an index of that country's industrial status and wellbeing.

B. Bickholt, of Frankfurt a/M, deals with the matter in some detail, with tabulated statistics of consumption of coal, electrical power, iron and steel, non-ferrous metals, and many other materials used in the chemical industry in Germany, furnishing ample evidence of its value as a trade promoter. Some figures for 1949 show that in coal consumption chemical industry took third place in western Germany with 4,778,000 tons, and in electrical power, it took first place with 5456 million kWh.

In consumption of non-ferrous metals in 1949 in western Germany, the chemical industry took third place, with 8 per cent of the total (rather a long way behind the consumption by the electrical and metal goods industries, with 24 per cent and 20 per cent respectively). Iron and steel for consumption in the chemical industry for general maintenance and repairs is estimated at 120,000-150,000 tons for the next few years, and capital requirements will probably take another 100,000 tons per annum.

In view of the wide and varied requirements of the chemical industry in plant, apparatus, and instruments, it is obvious that it is a very large consumer of glass, fine mechanical or precision goods, earths and minerals, packing materials, optical goods, paints and varnishes, and much else. It is estimated that in Western Germany the annual expenditure for coal and electrical power amounts to Dm. 500 million in the chemical fields alone; for non-ferrous metals, wood, textiles, glass, leather, cellulose and paper, a total of Dm. 200 million; and for iron and steel and general plant and apparatus Dm.600-800 million.

Of the total gross value of chemical production before the war—for the whole of Germany—averaging about Dm. 4-5000 million, about 40 per cent represented cost of raw materials and auxiliary materials (semi-manufactured, etc.), 10-15 per cent new apparatus, plant and repairs, and 10 per cent for packing and miscellaneous purposes.

Dutch Concern over German Competition

MANY Dutch chemical firms are concerned at the intensifying German competition, though the pace of Dutch expansion has so far been little affected. The Royal Sulphuric Acid Company, at Ketjen, reports that sales of potassium permanganate in Western Germany are being challenged by price cutting from Eastern Germany, where a factory was recently put into operation. A new line of production of this firm is saccharin. A well known pigment firm of Maastricht is also complaining of heavy German competition in the export markets.

Because of extensive home demands for oxygen, Electro Zum-en Waterstof, Ltd., of Amsterdam, has concluded a contract with the State mines of Limburg, to dispose of the mines' redundant oxygen supplies. The company points out that all international carbide producers are now working on a normal basis. Thus, because competition has become strong, the company prefers to process the more promising derivatives of carbide. A new factory for the production of acetic acid, acetaldehyde, vinyl acetate, solvents, etc., will soon be in operation. The Algemene Kunstzijde Unie, of Arnhem, is erecting a factory at Emmen, to produce Enkalon, a fully synthetic fibre akin to nylon. The stock material for the synthesis will be supplied by the State mines.

Because of overwhelming domestic demands, Holland has lately been unable to export sulphuric acid.

Chemicals for South African Industries

£8m. Expansion Programme of A.E. and C.I.

THE £8 million expansion programme of African Explosives and Chemical Industries to meet the varied industrial needs of the Union is now being actively implemented. Of interest to the gold mining industry is the extension of the company's calcium cyanide factory at Klipspruit. New plant to raise the production of ammonia by 32,500 short tons to nearly 60,000 tons a year is being provided at Modderfontein, where the existing plant is producing about 26,000 tons a year. A proportion of the increased output will be absorbed by the manufacture of explosives, which is rising steadily and is expected to reach four million cases of 50 lb. each by 1953. Part of the production will also go towards the manufacture of mixed fertilisers.

The survey, clearing and preparation of the site for the new factory are making rapid progress and orders have already been placed for the main items of the plant, where possible, to be made in South Africa. The large carbon dioxide removal towers, built to withstand pressures of 50 atmospheres, as well as the pressure storage vessels for anhydrous ammonia, will be supplied by the Vanderbijl Engineering Corporation, Vereeniging, while the gas plant will also largely be made in South Africa to overseas designs.

* * *

Basic oil will shortly be refined into lubricating oil in Durban for what is thought to be the first time in South Africa. The refining is to be done by a local firm which up to now has been re-refining lubricating oil already processed. Only small amounts would be dealt with until the arrival of new machinery.

* * *

The Industrial Development Corporation has now taken the lead in the oil-from-coal plans. The Anglo-Transvaal Corporation invested some £400,000 in pioneering outlay, but found that the enterprise was too big for a single company without Government assistance. No support was forthcoming from the powerful private interests engaged in the sale of petroleum products, their attitude, in fact, being discouraging. To bring the oil-from-coal scheme in South Africa to fruition the I.D.C. has now been authorised to raise Government-guaranteed loans, some of which may come from the U.S.A.

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Tinted aluminium foil to provide a decorative and protective wrapping is now being made in South Africa by a Germiston firm from raw material supplied by the Aluminium Co. of South Africa, Ltd., Pietermaritzburg.

* * *

Considerable advance in the technique of producing thin wall thermo-setting mouldings for plastics is claimed by Rhodesia Plastics, Ltd., Salisbury, Southern Rhodesia. One of the main applications of these thermo-setting mouldings has been to pharmaceutical and cosmetic containers. A notable example is a cream jar with flush side fitting lid. The two sections forming the inner and outer layers of the jar are moulded in one piece.

The Asbestos "Boom"

AS a commercial product today, either in a buyers' or sellers' market, asbestos is proving a steadily marketable commodity and, as a result, the industry is experiencing the greatest boom ever known in its long history, writes W. E. Sinclair in the *South African Mining and Engineering Journal* (*61*, 567). He foresees the possibility of asbestos being displaced by one or two more substitutes which might be produced more cheaply and considers that, but for that, substantial increases would have occurred in asbestos prices.

The present development of deposits and of ore dressing, he suggests, are not sufficiently well organised to ensure continuing returns at economic costs.

New Petroleum Catalyst

A NEW industry for the production of a special catalyst substance, previously manufactured only in the United States, which will help increase the yield of high grade petrol from crude oil in this country, is to be founded at Warrington. The industry is expected to find employment for about 250 operatives. The catalyst, a fine grain material, will be produced in part of the Warrington works of Joseph Crosfield and Sons, Ltd. In the traditional oil cracking process relying only on heat and pressure, 30 per cent petrol was commonly obtained. The new catalyst is stated to facilitate yields of up to 50 per cent.

THE UGANDA PHOSPHATE DEPOSIT

Fuller Development Expected

THE recent development at Tororo, near the eastern boundary of Uganda and the Kenya-Uganda railway, of a large deposit of phosphate has derived interest from the general phosphate deficiency of East and Central African soils and the relatively high cost of the imported material.

The mine, lying a little south of Mount Elgon, is being worked in a primitive fashion today, but its fuller development is expected to follow the supply of cheap electric power from the Owen Falls dam, where hydro-electric plant is to be installed.

Primitive workings at Tororo

The mineral is a low grade phosphate, too insoluble to be used successfully as a fertiliser without treatment, although many tons have been used for that purpose in Kenya. It cannot be made into superphosphate because of its high iron content.

Heat Treatment

It has been found that the best treatment so far has been to raise the deposits to a high temperature in the presence of sodium carbonate, and this is being done in a small kiln in Nairobi. Sodaphosphate is the name which has been given to the product in Kenya, and local farmers have used it with very good results, although it is not as soluble as superphosphate. The difference in the price of the local product and that of imported superphosphate is acting as an effective incentive to farmers to use the local phosphates.

Sodium carbonate is also a local product, obtained from the Magadi Salt Lake 74 miles south-west of Nairobi. It is expected that the large-scale manufacture of the fertiliser will be sited somewhere between the phosphate and sodium supplies.

As is well known, Magadi Soda Lake, with its 10 ft. crust of raw sodium sesquicarbonate, is the largest single deposit in the world, covering an area of nearly 36 square miles. The Magadi Soda Co., Ltd., produces about 400 tons of anhydrous carbonate of soda daily at present, and the plant is constantly being increased.

Improving Oil Extraction Methods in Ceylon

THE Government of Ceylon is to establish in about 12 months a vegetable oil factory for the manufacture of processed products from coconuts and for the extraction of oil from seeds and from the residues left by relatively inefficient local processing. Private investors foreign and local, will be invited to contribute up to 49 per cent of the capital and the undertaking will be run as a national corporation.

The factory will occupy a 27-acre site at Seeduwa, the centre of the coconut milling industry, and will cost Rs. 12 million. The construction and equipping of the factory has been entrusted to Bamag, Ltd., London, whose managing director, Colonel M. A. McEvoy, is now in Ceylon to supervise operations.

At present much coconut oil is expressed from copra by methods which leave 10 to 22 per cent of the oil in the residual poonac. The factory is to buy this poonac from the millers and take more oil from it by solvent extraction, leaving only 1 per cent in the residue. What is left will be compounded with fish meal, molasses and rice bran to form a very valuable cattle food. The crude oil obtained will be converted partly into glycerin and partly into distilled fatty acids for the soap and rubber industries. The factory will also manufacture edible oils, and extract non-edible oil from rubber seed.

WORLD SOURCES OF MANGANESE

U.S. Survey of Changing Pattern of Production

DIMINISHED supplies of manganese in the preceding year made 1949 a critical period for the United States steel industry, which was faced with the serious prospect of curtailed steel production.

Under present technology, the use of manganese, one of the most important strategic materials, is indispensable in the production of steel, the bulk of the world's output being used in that industry.

The American supply position in manganese ore was, however, greatly improved during 1949. Total imports rose from 1,124,000 long tons in the previous year to 1,379,000 tons in 1949, an increase of nearly 23 per cent.

This increase is significant in that the U.S.S.R., which supplied 385,000 tons in 1948, or roughly 34 per cent of the total for that year, accounted for only 73,000 tons in 1949.

Virtual cessation of Russian manganese shipments was offset by an acceleration of imports from India, the Union of South Africa, and the Gold Coast.

These facts are recalled by Louis A. Cassara, metals and minerals branch, commodities division, Office of International Trade. (*Foreign Commerce Weekly* (Vol. 39, No. 5)).

Of the major steel-producing countries, only Russia has within its national boundaries sufficient manganese ore to supply its needs.

Although large quantities of low-grade manganiferous ores are found there, the U.S.A. is almost completely dependent upon foreign sources of supply to meet its domestic requirements for high-grade manganese ore, and the continued availability of this strategic commodity is evident.

Factors Governing Shortage

Many factors contributed to the shortage in 1948—recalls the *Foreign Commerce Weekly* article—among them being transport problems in South Africa, and unsettled political conditions that followed partition in India. Cuban production declined because of high labour costs, while most of the output from the Gold Coast went to the U.K., Canada and Norway.

As a result of the large increase in steel production, the U.S. share of total world manganese imports rose from 29 per cent in 1937 to 66 per cent in 1947.

During the war, the U.S. doubled its imports of manganese, in comparison with pre-war totals, despite the fact that there were no imports from Russia. Increases in imports from Brazil, India, and Cuba offset the loss of Russian shipments. Although Gold Coast production was high, most of the ore mined went to the United Kingdom to support that nation's industrial mobilisation.

A significant development of this period was the beginning of manganese trade between the Union of South Africa and the U.S. Imports from this source, which were negligible in 1939, rose to 238,000 tons in 1940.

South African Supply Source

Throughout the war most of the manganese mined in South Africa was shipped to the U.S.A. To-day the Union is its second most important source of supply. It provided 316,000 tons in 1949, against 194,000 tons the previous year.

Manganese exports from South Africa to all countries reached 680,000 tons in 1949, more than double the quantity exported in 1948.

More than 27 per cent of the U.S. manganese imports in 1949 came from India, now the principal source of supply. By the end of the year imports from this source were at an annual rate of nearly 500,000 tons.

Most of the obstacles that hampered exports from India have been eliminated, and in order to realise maximum dollar earnings for manganese the Government has, since devaluation, tried to raise the rupee selling price of the ore to restore the dollar prices to the level prevailing prior to devaluation.

Although there was a slight increase in imports from Brazil in 1949, the quantity was less than anticipated. Nearly all of Brazil's manganese production is exported to the U.S.A. Developments in Brazil point to the likelihood of that country becoming the most important source of supply for manganese for the U.S.

Imports from the Belgian Congo, which amounted to less than 3000 tons in 1949, may increase if plans materialise to exploit the deposits in the Malonga area.

Increases may also be expected from Angola, where a new company has recently been formed to exploit that country's manganese deposits.

OVERSEAS

New French Detergent Factory

A Paris report announces that the Société des Produits Chimiques de Shell-Saint-Gobain is to build a large synthetic detergent factory at Rouen, similar to those already existing in Holland and Great Britain.

U.S. Sugar Substitute for Ireland

A new medical preparation expected to be on sale in Ireland shortly is Sacrocyl, made by Abbotts, of Chicago. The preparation is stated to be 30 times sweeter than sugar, and does not break down under cooking. It is indicated for diabetes.

Power Alcohol Mixture Prohibited

The Chief Commissioner of Delhi, India, has temporarily prohibited the mixing of power alcohol with motor spirit. The mixture, it is alleged, reduces mileages per gallon by about 30 per cent, unless the engine is adjusted, and by about 20 per cent with changed jet and ignition. Power alcohol is said to produce increased cylinder wear.

New Ownership of U.S. Company

The M. W. Kellogg Company, refinery and chemical engineers of Jersey City and New York, announced last week that the company had sold the stock and assets of one of its subsidiaries—the Kellex Corporation—to the Vitro Manufacturing Company. This implements the Kellogg policy of concentrating its commercial development, engineering and manufacturing efforts in the petroleum, chemical and power fields.

More U.S. Titanium Pigments

Titanium pigments for paints, at the rate of 60,000 to 70,000 tons annually, will be produced in a new plant at St. Louis, Missouri, which is being erected there by the National Lead Company. Production is expected to start within a year with the plant achieving full production in about 18 months. Producers of titanium pigments have been under considerable pressure in recent months to meet all demands, particularly for titanium dioxide.

Australia to Double Steel Output

Doubling of Australia's steel output is proposed under an expansion scheme recently announced by Australian Iron & Steel Ltd., the largest operating subsidiary of Broken Hill Pty., Ltd. The capital of this company is to be increased from £A8.5 million to £A20 million. The project includes erection of a hot strip mill, a cold strip mill and a plant at Port Kembla for making tinplate, the only major steel product not now produced in Australia.

China's Chemical Programme

The Chinese government is reported to have a plan for a centralised industry to produce not less than 20 million tons of fertilisers yearly, dyestuffs and cement. Plants and hydro-electric generators in the N.-East are to be constructed on the banks of the Yangtze.

Radioactive Isotopes in U.S. Petrol Research

It is reported from the U.S.A. that a new radio-chemical laboratory will be completed at Bartlesville petroleum experimental station, Oklahoma, by September. The laboratory is to be used for the investigation with radioactive isotopes of the secondary recovery of mineral petroleum by water flooding and the injection of gas and air.

New Grade of Carbon Black

The grade of carbon black recently developed in the U.S.A. by the Phillips Petroleum Company, Bartlesville, Oklahoma, called SAF black, is expected, when used with "cold" rubber, to produce tyre treads having 25 to 50 per cent better wear resistance. It is produced from oil by a continuous process and trial quantities are now being distributed to U.S. industries.

India to Process Monazite

India is to make profitable use of the monazite deposits in Travancore in a processing plant, expected to produce thorium and uranium, on which work has started at Alwaye as a joint enterprise of the Governments of India and of Travancore-Cochin. It may be in production in six to eight months. The estimated cost, about Rs. 1 crore, will be shared by the two governments in the ratio of 55 per cent (India) and 45 per cent.

Disposal of German-Italian Works

The Allied Commission for the administration of private property in Italy has recently sold by auction the Gubra chemical works at Desio near Milan. The plant is reported to be in good condition and to have been acquired by a group of local industrialists. The German participation in the Societa Italiana del Litopone, Milan, a company associated with the Montecatini group, has also been offered for sale.

PERSONAL

SIR WILLIAM J. LARKE, K.B.E., was re-elected as president of the British Welding Research Association at the annual general meeting on July 13. SIR CHARLES S. LILLICRAP, K.C.B., who is director of naval construction at the Admiralty, was elected chairman, and SIR STANLEY GOODALL, who resigned the chairmanship owing to ill-health, now holds the office of vice-chairman.

SIR JOHN ANDERSON was elected president for the ensuing year of the British Standards Institution at its annual general meeting last week.

MR. R. J. SMITH, formerly head of the cotton section of the dyehouse department, Imperial Chemical Industries, Ltd., Blackley, has been appointed an assistant chief colourist.

DR. D. M. MORRISON, of Montreal, is the new chairman of the board of the Chemical Institute of Canada. Mr. Garnet T. Page, Ottawa, continues to serve as general manager.

Dr. James H. Lum, managing director of Monsanto Chemicals (Australia), Ltd., has announced the appointment of MR. T. G. CRANE as deputy managing director of the Australian company. Mr. Crane is expected to go to Melbourne early in 1951. He joined Monsanto Chemicals, Ltd., nearly 18 years ago as an assistant plant chemist in the rubber chemicals section of the Ruabon works. He has been manager of the technical sales department for some time and has been in close touch with the markets for the new products coming from the recently constructed works at Newport, Mon.

DR. C. SYKES, director of research of the Brown-Firth research laboratories, has retired from the chairmanship of the divisional panel of the metallurgy division of the British Iron and Steel Research Assocation, and has been succeeded by MR. W. BARR, chief metallurgist of Colvilles, Ltd. MR. G. H. JOHNSON, managing director of the Kettering Iron & Coal Co., Ltd., has retired from the chairmanship of the divisional panel of the association's iron making division and MR. W. C. BELL, joint director of research of Stewarts & Lloyds, Ltd., has accepted the chairmanship. Mr. Johnson will be deputy chairman.

MR. B. J. HAILL, production superintendent of the Dunlopillo division at the Dunlop Rubber Company's Walton factory, has been appointed works manager of the new factory on the Hirwaun Trading Estate in South Wales. He is succeeded at Walton by MR. A. TAYLOR, previously his assistant.

PROFESSOR P. M. S. BLACKETT, Longworthy professor of physics, Manchester University, was among the British scientists to be awarded corresponding membership of the east German Academy of Sciences. The occasion was the 250th anniversary of the former German academy of sciences, the work of which the east German academy claims to continue.

MR. R. P. GRUNDY has joined the staff of Triplex (Northern), Ltd., St. Helens, Lancs., as technical assistant to MR. H. IRWIN, director and general manager.

MR. CHARLES J. HOLLAND MORITZ, former vice-president of the Aluminum Company of America, who died in Boston, Mass., in 1948, left estate of the gross value of $2,519,226.

Obituary

Deep regret was occasioned by the news that MAJOR E. F. CAMPBELL, widely known here and overseas as an expert adviser on chemical apparatus, had been killed in a motor accident on July 6 during a holiday in Scotland. Major Campbell was principally associated as a technical specialist with the Walthamstow branch of Baird & Tatlock (London), Ltd., of which he was a director, and had made several visits to India on the company's behalf.

The death has occurred of MR. N. GUNN, secretary and a director of Mullard Electronic Products, Ltd., and of its associated companies. He had been connected with the Mullard organisation since 1920.

BETRO's Future

If Britain is to maintain her export drive " hit-and-miss " methods of trading must be abandoned, declared Mr. Leslie Gamage, chairman, at the annual meeting in London of the British Export Trade Research Organisation. It had been decided that in future BETRO should stand on its own feet without Government assistance.

· HOME ·

Fractured Flywheel

When the 5-ft. flywheel of an engine at Ribble Paper Mills, Walton-le-Dale, Preston, burst on July 12, a 2-cwt. piece of steel flew through the roof of the single-storey shed and landed in the yard of a house 100 yards away. In its flight it glanced off the roof of a house, bringing down part of the roof, a bedroom window, and a portion of the wall.

New Steel Prices

Maximum prices of a limited range of iron and steel products, mainly those affected by the recent increase in the price of nickel, are amended under a new Ministry of Supply order, Iron and Steel Prices (No. 2) Order, 1950, which operates from July 17. The chief alterations are in the prices of alloy steel billets according to quality; the order also increases the prices of other alloy and stainless steel products.

Ambulance Team's Successes

A team from I.C.I., Ltd., Runcorn, won the two-men ambulance competition at the National Fire Tournament, at Eastbourne on July 12. They scored 52 out of 66 points. On July 11 the team won the senior one-man ambulance contest and on July 13, a team won the four-men ambulance event in the final contests. They have won three of the four ambulance competitions.

White Oxide of Antimony

A further reduction in price of Cookson's white oxide of antimony was announced this week by the Associated Lead Manufacturers, Ltd. Costs of the Red Star grade range from £131 10s. for lots of 100-tons to £136 for lots of 5-cwt. Green Star prices are £3 per ton less and White Star £3 per ton more. Reduction has been made possible by a somewhat lower cost of raw materials. The pigment is now being exported to the U.S.A.

Zinc Premiums Raised

Premiums for 99.99 per cent refined and electrolytic zinc were this week increased as follows: Refined and electrolytic zinc, £4 10s. (old premium 15s.); not less than 99.99 per cent purity, £10 10s. (old premium £2 5s.). The price of g.o.b., Prime Western and debased is unchanged. The prices of zinc metal sold by the Ministry of Supply a long ton delivered buyer's premises are therefore: G.O.B., Prime Western and debased, £127 10s.; refined and electrolytic, £132; not less than 99.99 per cent purity, £138.

Terylene Net for 14th Century Garment

The newest textile material, Terylene, dyed by I.C.I., Ltd., to match the ground colour of the garment, was used as a protective netting to preserve the jupon of the Black Prince, which has been hanging in Canterbury Cathedral since 1376.

Lead Price Twice Raised

The price of good soft pig lead was increased twice last week following rises in American and Canadian quotations. The first increase on July 13 was by £4 from £88 to £92 a ton. The second the following day by a similar amount brought the price up to £96 a ton, thus restoring the two cuts made at the end of June.

Strikes Affect Coal Output

Production of coal in the U.K. in the week end July 15 totalled 3,897,500 tons, of which 277,900 tons were opencast, compared with 4,004,700 tons the week before. The reduction in output of 127,200 tons through disputes was mainly due to Scottish strikes, though recognised holidays accounted for 333,400 tons.

Drugs Should be Free for All

Representatives of the British Medical Association, at their annual meeting, unanimously supported Dr. H. H. Goodman's motion calling for free medicine and appliances for private patients. Dr. Goodman said that these patients probably paid more than others in general taxation and should have the advantages of free drugs for which they had contributed.

Widening Programme of Laporte

The rapidly expanding research and production programme of Laporte Chemicals, Ltd., was described by Mr. L. P. O'Brien, chairman, at the 43rd annual general meeting of the company held last week at Luton. An increase in research staff during recent years had been amply justified, he said, and the laboratories built in 1936 were now quite inadequate. During the next few years additional laboratory accommodation costing £50,000 was to be built at Luton, also a new experimental plant house for developing new processes. National Titanium Pigments was building bigger and better designed plant to be known as Battery Works, Stallingborough, North Lincolnshire, which will cost £1.5 million over the next few years. New hydrogen peroxide plant was now coming into successful operation and would help to keep prices as low as possible.

The Stock and Chemical Markets

BUSINESS has remained very limited because of the news from Korea, and most movements were small and indefinite. A small rally in British Funds, however, helped the general undertone. The Korean developments have not led to any heavy selling and this is now tending to hold sentiment, although buyers are extremely cautious. In fact, quotations for many smaller priced industrial shares have not been adequately tested by dealings in recent weeks.

Chemical shares again remained relatively steady with Imperial Chemical at 40s., Laporte Chemicals 5s. units 10s. 4½d., and Fisons slightly easier at 25s. 6d., at which there is a generous yield, provided that the estimated 9 per cent dividend is forthcoming. Monsanto kept at 49s. 6d. and British Glues & Chemicals 4s. units have remained firm at 21s. 9d., on expectations that the results will create a good impression. Lever & Unilever, however, receded further to 38s. 3d. awaiting the annual meeting. This may provide news of the company's new capital requirements, which, it is suggested, may amount to over £10 million, partly because of the bigger stocks to be financed following the end of soap rationing. Prevalent belief is that in any issue of capital, which would probably be in debentures or some other form of prior charge, stockholders would be offered preferential terms of allotment.

Albright & Wilson have further strengthened to 29s. 3d., another case where more capital will soon be required, and where the market assumes that shareholders would probably have allotment on preferential terms. Boake Roberts were 26s. 6d., Bowman Chemical 4s. shares 5s. 3d., F. W. Berk 10s. 3d., "ex" bonus, Amber Chemical 2s. shares 3s., while Brotherton 10s. shares kept at 20s. and Pest Control were 7s. 6d. Woolley 4¾ per cent debentures, in which dealings started recently, were 104½. W. J. Bush ordinary shares remained firmly held and quoted at 72s. 6d., following publication of the results, L. B. Holliday 4½ per cent preference kept at 19s. 6d., and British Chemical & Biologicals 4 per cent preference were 17s.

There has again been activity in the 4s. units of the Distillers Co. around 18s., on market expectations of good financial results. Estimates of the dividend on the capital, increased by the 50 per cent share bonus, range up to 20 per cent. Turner & Newall eased to 81s., United Molasses to 41s. 6d., but Borax Consolidated deferred at 54s. 6d. were steady, although British Oxygen eased to 95s. following news of the explosion at one of the company's factories. Glaxo Laboratories 10s. units changed hands actively around 46s. 6d., British Drug Houses 5s. shares were 7s. and Boots Drug, at 46s. 3d., held part of an earlier improvement. British Match at 34s. 3d. were lower, following publication of the results and the chairman's reference to the extremely large proportion of the group's earnings absorbed by taxation. Paint shares also turned easier with Lewis Berger at 27s. 9d. and Pinchin Johnson at 39s. 10½d; profit-taking following publication of the financial results.

There was some selling of oil shares which once again showed the effect of international news. Anglo-Iranian were down to £5¾ and Shell to 60s. 7½d.

Market Reports

DESPITE the approach of the holiday season, trading conditions on the industrial chemicals market have remained fairly active with rather more interest in forward business. Inquiries for shipment have been on a good scale and have covered a wide range of materials. The general run of the soda and potash products have all been in good request while formaldehyde, arsenic and hydrogen peroxide are moving well. A fairly active demand for solvents has been reported as well as for paint raw materials. Price changes have been comparatively few but fluctuations in the price of lead have necessitated adjustments in the Convention quotations for white lead and red lead. The basis prices for these are now £124 per ton and £114 10s. per ton. An active interest is maintained in the coal tar products market, with most items in steady request. Pitch, creosote oil and phenol are particularly noted and a good demand continues for the light distillates.

MANCHESTER.—The outstanding price movements on the Manchester chemical market during the past week have been renewed advances in the lead compounds following upon the easiness which developed recently. Otherwise the market as a whole has continued steady to firm. Holidays are still affecting to some extent the movement of supplies of the alkalis and other leading products into home consumption, but, apart from this, trade is on steady lines, with a fair volume of new

(continued on page 142)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALLIED GUANO & CHEMICAL CO., LTD., London, E.C. (M., 22/7/50.) June 14, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Westwood, 9 Elgin Road, Talbot Wood, Bournemouth. *£7000. June 15, 1949.

BURTON, RHODES & CO., LTD., London, W., manufacturers of polishes, etc. (M., 22/7/50.) June 9, charge, to National Provincial Bank, Ltd., securing all moneys due or to become due to the bank; charged on certain moneys payable to company under a policy of assurance. *Nil. Nov. 4, 1948.

Satisfaction

A. P. V. CO., LTD. (formerly ALUMINIUM PLANT & VESSEL CO., LTD.), London, S.W. (M.S., 22/7/50.) Satisfaction June 21, of charge registered January 25, 1921.

Receivership

CHEMO - PLASTICS, LTD., Wrecclesham Factory, Portsmouth Road, Farnham. (R., 22/7/50.) Mr. D. R. Clack, Adelaide House, King William Street, E.C.4, was appointed receiver and manager on June 22, 1950, under powers contained in debentures dated November 12 and December 10, 1948.

Company News

"Francolor"

The report for 1949 of S.A. de Matières Colorantes et Produits Chimiques "Francolor"—the first to be issued since the company's formation during the German occupation of France—reveals a net profit of Fr. 506 million compared with Fr. 319 million in 1948. Sales in 1949 were valued at Fr. 10,856 million (1948 value Fr. 10,542 million), of which Fr. 3493 million (Fr. 3013 million in 1948) were accounted for by exports to foreign countries and to French colonies.

William Neill & Sons (St. Helens)

The net profits of William Neill and Son (St. Helens) to March 31, 1950 totalled £81,147, an increase of nearly £7000 over the previous year. Dividend of 8d. per share is being made on 2s. ordinary shares (£18,333) compared with 6d. per share (£11,000) last year.

New Registrations

Cromil, Ltd.

Private company. (484,154). Capital £100. Manufacturers of soaps, polishes, solvents, cleansing and lubricating agents, chemicals, etc. Directors: R. A. Millard, C. G. Crowley. Reg. office: Commercial Union Chambers, 200 Wolverhampton Street, Dudley.

"Devon" Soaps, Ltd.

Private company. (484,316). Capital £100. Manufacturers of soaps, soap extracts, washing materials, etc. Directors: W. R. Fenton, B. Fenton and T. R. Fenton. Reg. office: Hilderthorpe Terrace, Garforth, Leeds.

Victoria Laboratories, Ltd.

Private company. (484,225). Capital £1000. Research and experimental work connected with chemicals, metals, minerals, etc. Directors: Prof. W. H. Linnell, F. G. Hobart, M. N. Freedman. Reg. office: 9 Arundel Street, Strand, W.C.2.

THE STOCK AND CHEMICAL MARKETS

(continued from page 140)

business reported. A moderate aggregate trade is passing in the fertiliser section at the higher level of prices. In the tar products market there is a steady demand for most lines, including the light distillates.

GLASGOW.—Business in the Scottish heavy chemical market has been extremely quiet this week due to the Glasgow Fair holidays. Export business continues to show activity.

ALUMINIUM FOIL

Scottish Enterprise in Ceylon

THE Achme Aluminium Co., Ltd., recently established in Colombo, has begun the production of aluminium foil linings for tea and desiccated coconut chests. When in full production it is expected to meet the Island's entire demand for aluminium foil linings. The price of the local product is slightly less than that of the imported linings. Production costs are likely to diminish.

This new industry comes from the enterprise of the Empire Aluminium Company, of Scotland, which in February last year sought Government sanction and assistance to establish an aluminium foil rolling factory in Ceylon. They pointed out that present imports were from Scotland, Sweden and Canada, and asked for certain concessions. Last June, concessions were granted in respect of import duty on machinery, paper for lining, and bulk aluminium consignments. The capitalised value of the company is Rs. 700,000.

New Form of Borax

A NEW borax product, available in free-flowing fine granular form, is announced by Borax Consolidated, Ltd., London. The new product, Neobor, is stable under normal atmospheric temperatures and pressures, but contains only five instead of the 10 molecules of water present in ordinary borax.

The new product is guaranteed at least 99.5 per cent pure. Typical analyses show the following comparisons between Neobor (penta-hydrate) and ordinary borax (deca-hydrate): Boric oxide (B_2O_3) 48.3 (ordinary grade 36.5) per cent, sodium oxide (Na_2O) 21.5 (16.3) per cent; water (H_2O) 30.2 (47.2) per cent.

Scope and use of the new material may be found in all industrial processes in which ordinary borax is now employed. These can be divided roughly into two categories, those requiring the borax to dissolve in water, and those involving fusion when the escape of the water of crystallisation imparts a stirring action to the furnace charge. In this respect, Neobor is superior to the anhydrous borax which is slower in dissolving in water and does not agitate the melt during fusion.

Neobor fuses at temperatures below 200° C. without the customary excessive puffing and frothing.

GAS TURBINE SCHOOL

Reopening in October

THE Farnborough school of gas turbine technology—the only one of its kind in the world—is reopening at Farnborough Place in October.

Because of expansion, the school, maintained by Power Jets (Research & Development), Ltd., has been moved from its old premises at Lutterworth where some of the earliest jet engines were designed and tested.

Founded in 1944 to instruct Dominions' Air Force personnel in aircraft jet engines, the school now gives instruction in the manifold uses of gas turbines. It has a wide range of equipment and engines, including test houses and a jet aircraft on which installation and practical ground instruction is given. There will be four types of courses, one for overseas engineers.

German Pharmaceuticals

A SURVEY of the pharmaceutical industry in Germany 1939-1945 is the subject of report No. 24 of the BIOS (British Intelligence Objectives Committee Surveys), the latest publication of the Technical Information and Documents Unit, Board of Trade. The survey (HMSO, 3s. 6d.) is edited by J. B. M. Coppock. He observes that the technique of German pharmaceutical manufacture during the period under review appeared to have been inferior to that of this country, but it would be dangerous to assume that it would remain so.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Training the Technologists

THE extreme difficulties which hedge around any attempt to produce a national policy that will ensure a well balanced supply of science-trained people needed for industry, research and education derive fresh confirmation from the current summing up by the principal body of experts in this country. The findings are those of the Advisory Council on Scientific Policy, the group of very able figures in science and industry over which Sir Henry Tizard presides, and it is fair to assume that the shape of Government policy in regard to university grants, aid to corporate research and regulations for industry itself will be influenced very largely by what this advisory council has to say. There is therefore good reason to be thankful for the fact that this farseeing group is not overloaded either with academic interests or with those whose preoccupation with production might blind them to the continual need for the kind of work which might appear to have no immediate utility.

The Advisory Council on Scientific Policy can be assumed to enjoy as comprehensive a view as any group's of what will be needed to ensure the accelerating rate of advance in the sciences and of their application in the country's industries. But with all their expertness and privileged supply of information, the members of this council are as reluctant to lay down a rigid programme to govern the equipment of scientists for the country's future needs as any other informed body would be. The third report on "Scientific Policy" does not seek to disguise the facts that the supply of scientists and their allocation cannot be regulated even with the wavering precision of a commodity rationing scheme, and that industry's future need of scientists is not susceptible to exact measurement from the standpoint of to-day. That does not preclude the advisory council, however, from offering some extremely illuminating conclusions about the future.

Perhaps the most interesting conclusion is that university departments have, in general, expanded sufficiently to satisfy the prospective demand for qualified workers in several of the principal fields of science—physics, geology, civil, mechanical and electrical engineering, biology and agriculture. The satisfaction that can be taken in such news, as affording a cheerful contrast with the estimates by the Barlow Committee of a formidable shortfall, will be tempered by the reservation, which the report includes, that "continuing shortages are expected in the fields of chemistry

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5) THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

and chemical engineering." One does not need to be a chemist to discern that those are the branches in which the call henceforth is likely to be the most imperative, and in which failure to supply what is required can have the most depressing influence on advances in methods and the scope of future production.

The advisory council must be well aware of that, as its comments on the need for ample supply and use of scientists indicate. Yet it has to be recalled that even the report upon the future supply of chemical engineers and probable requirements for their services which the Ministry of Labour's Technical Personal Committee was long ago expected to produce still appears to be in the preparatory stages. The advisory council has no comments to offer about that, but it has some very firm conclusions on the controversial subject of extending higher education in applied science, either within the universities or in specialist institutions.

Despite the knowledge that university chairs of chemical engineering are still rarities, the advisory council has not departed from the view that the universities should continue to be the prime centres for the more advanced training in the applied sciences. It is now squarely recognised, however, that the university faculties and the technical colleges are unlikely to supply unaided all that is needed, and that the proposed means of supplementing them cannot be called into being quickly enough to serve the needs of the moment. The advisory council's ruling is this:—

As soon as the resources, material and human, can be employed without detriment to the work in applied science which the universities are already doing, it would be prudent to establish one or more colleges of applied science, with suitable governing bodies of their own, but fitted into the university system. We would emphasise again that these colleges should be regarded as an addition, and not as an alternative, to the facilities already provided by university departments of applied science. The contribution of university departments of applied science, at both the under-graduate and post-graduate stages, to the immediate needs of industry is of great importance, for even if new institutes of higher technology are established, it cannot be expected that they will make an important contribution to higher technological education within much less than a decade."

Notes and Comments

High Level of Exports

THE latest record of British chemical exports during June has shown that the possibility of a recession in sales to the increasingly competitive overseas markets, of which chairmen of some chemical groups have given warning, has not yet become a reality. The record total sales of £8.428 million which the chemical categories ("chemicals, drugs, dyes and colours") achieved in June is evidence of this, and in surpassing by nearly £1.5 million the collective sales recorded 12 months before the export organisations have reaffirmed that scope still exists to restore in other markets the reductions which currency or political pressure have imposed elsewhere. Among the shipments which have collectively redressed so generously the several substantial cuts during June, most gratifying, perhaps, is the rise in chemical sales to the U.S.A., from £69,347 in the previous June to £255,949 last month, and the strong upward movement in most British countries overseas—Australia, New Zealand, Canada and Malaya (but not South Africa). The increasing difficulties of trade with India are again represented by a drop in sales by more than one-third by comparison of the June totals this year and last. Consolation can be taken from the further evidence that Pakistan's purchasing capacity seems to grow as India's wanes, and from the extremely high totals recorded for the principal sodium chemicals (carbonates £219,889 and caustic £281,540) against which virtual barriers have been raised in the Indian market.

Impersonal Festival

LONDONERS have been given visual reminders in the past few weeks that the Festival of Britain has emerged from the status of a project—admirable or frivolous, according to one's outlook—and is rapidly taking physical shape. No hasty conclusions should be drawn from the fact that the predominant outline on the Thames-side site at the moment is that of a mushroom, although it calls to mind the fact that one of the keystones of the South Bank attractions will be the Dome of Discovery, the centrepiece of a general panorama of British scientific and industrial enterprise, of which other wings will be at South Kensington and in Glasgow. The magnitude of the construction going on on the South Bank corresponds with the all-embracing character of the proposals to represent science and industry, calling for the expert services of some of the foremost people in science at the present time and the full collaboration of industries. The scientists will, as usual, remain in the background and, because the organisers are anxious that this shall not be confused with a trade exhibition, the same anonymity will be imposed on the industries—on whose achievements in the laboratory or the workshop most of the originality of the displays will depend.

No Names

A DISCONCERTING possibility is that this determination to avoid the "trade show" atmosphere will invest the picture of industry presented at the Festival of Britain with the tepid anonymity that characterises some BBC surveys when they are dominated by the same "no advertising" principle. To attempt to give a fair picture either of scientific discovery or of the application of discoveries without some recognition of the private organisations which have often carried out most of the tasks seems an absurdity. A great deal of Britain's scientific progress has sprung from private enterprise and must continue to do so. As it is, visitors to the Festival may be invited to believe that all discoveries here are made by university professors and that their applications depend largely upon government departments and committees, working parties, or even Royal Commissions.

If anonymity is to be rigidly preserved it is to be hoped it will apply as forcibly to nationalised undertakings as to private enterprises. Private enterprise and state monopoly must go to the Festival on equal terms if it is hoped to gain a full response to the "final invitation" which industries have received this week.

Education in Industry

TRAINING schemes to provide that young recruits are well equipped to serve the needs of industry are now fairly familiar. Much less often does one hear of equal thought being given to a complementary aspect of the same theme, the grooming of industries to ensure that the youngster receives the kind of reception and initiation which will help to make him or her happy and useful. That is the theme of a conference, the third to discuss "The Education of the Young Worker," to be held at Magdalen College, Oxford, on August 12 to 18. The Oxford University Department of Education, which is sponsoring it, believes that elaborate selection and technical training schemes, which were given careful thought last year and in 1948, do not alone discharge all the responsibilities which industries owe to the people who will help to form the industrial pattern in the future. The sponsors take a broad view of the amount of work which requires to be done on the subject of reception into industry. It does not end, as they remark, by ensuring that the reception officer has a pleasent smile and that there is a television set in the apprentices' common room. They sum up rather neatly one of the problems about which questions will be asked at Oxford in the hope that satisfactory answers will ultimately be framed: Who should teach them (the trainees) how to know nonsense when they hear it spoken?

LETTER TO THE EDITOR

NCB and Tar Research

Sir—May I refer to the editorial article in your issue of July 8, in which you state: "Wisely the NCB finances, and takes some part in directing, the work of some other associated research organisations. Among them is the Coal Tar Research Association, whose potential scope is discussed in this issue." This statement may perhaps convey the impression that the association's income is derived entirely from the National Coal Board, which is not in accord with the facts. The National Coal Board is one of the largest and most important members of CTRA, and the association has enjoyed the most wholehearted support from its representatives. However, it is only one of many members and, like all other members—area gas boards, tar distillers and independent coke-oven tar producers —contributes to the funds of the research association in proportion to the amount of tar which it produces and distills.

Yours, etc.—DONALD MCNEIL,
Director of Research.

The Coal Tar
Research Association,
Gomersal, near Leeds.

Fewer Dollars for Oil

A FURTHER agreement between the United Kingdom Government and an American-controlled oil company to reduce the dollar costs of oil imports to the sterling area was announced last week by the Ministry of Fuel.

The company, Caltex (U.K.), is a subsidiary of California Texas Oil, and under the deal it is proposed to reduce the "dollar content" of its oil supply to an average of about 80 per cent. At present supplies to the sterling area are about three million tons a year. It is estimated that when the scheme is fully effective in 1952, there will be a saving of $80-40 million annually.

The saving will be accomplished by a combination of three means: Using crude oil produced in Bahrein as sterling oil; making payments partly in sterling for crude oil purchased from the Arabian American Oil Company (Aramco) which is to switch a portion of its expenditure from dollars to sterling; and by converting, over a period, freight charges to a sterling basis.

The last proposal would necessitate building a number of tankers in the U.K. to transport oil from Bahrein to the sterling area.

EXPORTS AGAIN EXCEED £8m.

Sustained Improvement Since January

EXPORTS of chemicals, drugs, dyes and colours in June maintained the high level established in May with a total of £8,428,589 compared with £6,947,307 in June, 1949. Sodium compounds were all marked by large increases, the total value for the carbonates alone being £219,889 as against £79,756 in June last year.

The first six months of this year also showed the cumulative effect of the several rises in exports, the value of chemical manufactures being £25,512,417 compared with £23,428,555 in 1949, and £21,908,843 in 1948. Total of all chemicals, drugs, dyes and colours for the period was £47,101,387, an increase of £2,560,482 over the first half of 1949.

EXPORTS	June, 1950	June, 1949
	Gal.	Gal.
Cresylic acid	221,869	83,565
	lb.	lb.
Salicylic acid and salicylates	182,184	120,362
Value of all other sorts of acid	£155,377	£109,985
	Tons	Tons
Sulphate of alumina	2,190	3,405
All other sorts of aluminium compounds	1,836	413
Ammonium sulphate	18,580	33,262
Ammonium nitrate	3,699	3,883
All other sorts of ammonium compounds	1,202	1,193
	Cwt.	Cwt.
Bleaching powder	20,209	29,752
All other bleaching materials	12,472	9,711
Collodion cotton	2,202	3,343
	Tons	Tons
Copper sulphate	2,727	4,988
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	46,393	52,361
	Tons	Tons
Fertilisers	1,517	811
Value of gases (compressed, liquefied or solidified)	£22,926	£18,914
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	12,038	4,774
	Gal.	Gal.
Tetra-ethyl lead	109,680	86,586
	Tons	Tons
Magnesium compounds	1,147	597
	Cwt.	Cwt.
Nickel salts	2,519	3,672
Potassium compounds	7,549	4,751
	Tons	Tons
Salt	22,470	15,321
	Cwt.	Cwt.
Sodium carbonate	430,843	150,372
Caustic soda	224,805	157,998
Sodium silicate	34,593	17,045
Sodium sulphate	136,091	65,725
All other sodium compounds	83,030	59,592
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	2,443,167	1,129,355
	Tons	Tons
Zinc oxide	917	838
Total value of chemical manufactures (excluding drugs and dyestuffs)	£4,425,050	£3,665,357
Value of quinine and quinine salts	£44,718	£34,405
	lb.	lb.
Acetyl-salicylic acid	161,019	135,286
	100 International Units	100 International Units
Insulin	808,832	943,679
	Mega Units	Mega Units
Penicillin	1,298,565	683,863
Total value of drugs, medicines and preparations	£1,906,857	£1,676,732
Total value of dyes and dyestuffs	£941,804	£732,534
Total value of paints, pigments, colours, etc.	£1,154,878	£872,684
Total value of chemicals, drugs, dyes and colours	£8,428,589	£6,947,307
Plastic materials:		
	Cwt.	Cwt.
Synthetic resins, solid and liquid, including adhesives	25,928	17,168
Moulding powders	18,791	9,130
Sheet, rod, tube, film and foil—Laminated	2,247	1,910
Non-laminated: acrylic	3,833	2,234
celluloid	1,268	773
other sorts	2,854	2,129
Total value	£716,144	£426,268
	Cwt.	Cwt.
Chemical glassware	1,404	1,008
Value	£62,731	£44,575
	Cwt.	Cwt.
Fans	5,663	3,342
Value	£139,942	£104,353
	Cwt.	Cwt.
Furnace plant	10,019	6,834
Value	£133,603	£81,972
	Cwt.	Cwt.
Gas and chemical machinery	16,796	18,950
Value	£252,991	£214,319
Scientific instruments: optical		
Value	£83,528	£78,318
Thermometers, mercury in glass, etc.—**Value**	£44,053	£36,868
	Cwt.	Cwt.
Air and gas compressors and exhausters	14,373	13,684
Value	£308,377	£291,849
Non-Ferrous Metals:		
	Cwt.	Cwt.
Aluminium and aluminium alloys	89,478	116,252
Value	1,125,246	£1,316,552
	lb.	lb.
Bismuth metal (not including alloys)	30,379	9,857
Value	£19,883	£5,286
	Tons	Tons
Copper	5,531	8,951
Value	£1,163,718	£1,338,400
	Tons	Tons
Lead, unwrought, sheet, etc	330	275
Value	£48,932	£43,300
	Cwt.	Cwt.
Nickel and manufactures thereof	16,908	24,757
Value	£335,138	£347,958
	Cwt.	Cwt.
Nickel alloys	7,784	7,237
Value	£167,238	£147,676
	Tons	Tons
Tin, unwrought	1,647	271
Value	£991,795	£155,089
	lb.	lb.
Tungsten (except ferro-tungsten)	10,709	16,503
Value	£8,992	£16,829
	Tons	Tons
Zinc	367	429
Value	£66,153	£56,758
Total value of non-ferrous metal group	£5,784,999	£5,078,318

Parliamentary Topics

THE possibility that fire hazards in trains may be increased by application of lacquer finish to paintwork was the subject of a question by Sir R. Glyn. He asked if the Minister of Transport was aware that the report of the DSIR into the fire on a train last autumn near Berwick disclosed that the lacquer paintwork was 16.7 per cent nitro-cellulose and 75 per cent solvent; how far the conditions in the recent fatal fire on the Birmingham-Glasgow train were similar and what action was being taken.

Mr. A. Barnes said the report of the inspecting officer of railways (THE CHEMICAL AGE, 62, 480) indicated that the composition of the clear lacquer was substantially as stated. Coaches sprayed with this particular cellulose lacquer had been withdrawn immediately after the accident. Other coaches in which cellulose lacquers of any kind might have been used were being tested for fire risk as they passed through workshops for repair, and suitable preventive precautions were being taken. The whole question of the interior finishing of railway coaches in relation to fire risks was under review with the Railway Executive.

The fatal fire near Beattock on June 8 this year was still under review by an inspecting officer of railways, and he could therefore make no statement until a report had been received.

REOPENING of the London Metal Exchange to deal in copper was urged by Mr. W. Fletcher. Replying, Mr. G. R. Strauss, Minister of Supply recalled the previous statement on June 20 by Mr. John Freeman (Parliamentary Secretary) that it did not seem possible to free the market either until our dollar balance was a great deal more secure or until it was possible to satisfy a much higher proportion of our needs of electrolytic copper from Northern Rhodesia. Mr. G. R. Strauss said he was willing to consider any proposals which would overcome these difficulties.

OIL pollution from ships and refineries in Southampton harbour and the neighbourhood of the Isle of Wight was the subject of questions by Surgeon Lieut.-Commander Bennett. Mr. A. Barnes, Minister of Transport, stated that the Oil in Navigable Waters Act, 1922, gave him no power to take proceedings for an offence committed within a harbour. In further discussion of discharge of oil from the refinery at Fawley and tankers using it, the Minister said that if the question was put down he would endeavour to answer it.

POLLUTION of beaches from oil was also referred to by Mr. A. Barnes, who recalled that a voluntary agreement stipulated that oil should not be discharged from ships within 50 miles of any coast.

Fertiliser Subsidy

IN a broadcast on July 28 the Minister of Agriculture, Mr. Tom Williams, spoke of the new subsidy on fertilisers. Mr. Williams said: "The Bill providing for this subsidy has passed through Parliament, and when it becomes an Act I shall issue a scheme to put it into operation. I want to mention only two points now. First, I intend that the scheme will date back to July 1 this year—the day on which the prices for fertilisers went up. Fertilisers bought at the new prices and applied to grassland will qualify for the grant of one-third of what they cost, or if applied to ploughed up old grass of two-thirds of their cost—subject, of course, to the maxima laid down in the scheme.

"My second point is this: If you want to apply for the subsidy in due course, you should keep a careful record now of the amount actually applied to grassland or ploughed-up grassland and the fields to which it was applied."

Rubberised Roads Experiment

TESTS are being carried out at Dunlop's factory at Speke, Liverpool, of a new "rubber" road surface. Four stretches of roadway are under observation, two laid without rubber and two containing a small percentage of rubber. The rubber is in the form of a powder produced from natural latex and has been added to a fine asphalt surface mixture and to a medium texture tar surfacing mixture. The Dunlop organisation states that, in the laying, the rubber mix behaved in the same way as the ordinary road material. The whole of the considerable traffic entering the Speke factory now passes over all four surfaces. These tests are intended to substantiate claims that the rubber treatment lasts longer, costs less and reduces skidding. If this is firmly established, it is believed that demand upon the rubber industry will be considerable.

SOUTH AFRICA'S METALS AND MINERALS

Higher Production and Export Levels

OUTPUT of most metals and minerals in the Union of South Africa increased in 1949 by comparison with 1948. Side by side with this increased production there was an increase in the volume of exports. In 21 of the 26 base minerals exported increased tonnages were recorded, and the value of base mineral exports during the year totalled £11,624,296 compared with £7,311,188 in the previous year, according to statistics issued recently by the S.A. Department of Mines and quoted by *The South African Mining and Engineering Journal.*

Antimony production from the Consolidated Murchison increased from 7437 tons to 7990 tons, all of which, save 17 tons sold locally, was exported to the United Kingdom.

The output of asbestos during the year showed a considerable increase. Amosite output rose from 30,372 to 41,974 tons; anthophyllite production was 154 tons against a nil return in the previous year; the output of chysotile increased from 4441 to 7609 tons; Cape blue output increased from 8301 to 11,999 tons; and output of Transvaal blue has also increased appreciably. Export figures also showed a considerable increase. Amosite exports rose from 27,685 to 39,269 tons; chrysotile from 1279 to 5142 tons; Cape blue from 7826 to 11,290 tons; and Transvaal blue from 1810 to 7727 tons.

Beryllium and Bismuth

The output of beryllium ore, carrying an average of 10.30 per cent BeO, increased from nil to 246 tons. The whole of the output was exported, the United States taking the major part of the output at a price of over £95 per ton. Bismuth production increased from one to 12 tons, all of which was exported to the United Kingdom and fetched almost £200 per ton.

Copper production during 1949 totalled 32,758 tons against 31,960 tons in 1948. Exports of fire-refined and blister copper totalled 33,081 tons against 25,880 tons in 1948. The output of corundum in crystal form increased from 438 tons in 1948 to 588 tons in 1949. The output of corundum concentrates showed a slight fall from 2859 tons to 2188 tons.

The production of lead concentrates in 1949 totalled 290 tons against 228 tons in 1948. Exports in 1949 amounted to 141 tons compared with 107 tons in 1948, the bulk of the output going to Belgium.

The output of manganese during 1949 more than doubled the 1948 output, the relative figures being 722,211 and 304,673 tons. Exports during the year totalled 763,662 tons against 354,860 tons. The U.S.A. bought 418,033 tons of the 1949 output, while the United Kingdom took 112,000 tons.

Production of Mineral Pigments

Production of mineral pigments also showed an increase during 1949. Ochre totalled 6656 tons against 5157 tons, and oxide production dropped from 3177 tons to 2048 tons, but umber output increased to 910 tons from 641 tons. Exports of ochres totalled 4707 tons compared with 4682 tons in 1948, while 97 tons of oxides were exported where none had been exported in 1948. Britain took the bulk of the ochres exported.

The production of nickel, contained in matte, totalled 625 tons in 1949 against 505 tons in 1948. Exports including quantities left from the previous year's output, amounted to 680 tons valued at £136,023, compared with 454 tons in 1948 valued at £75,661. All was exported to the United Kingdom.

The output of platinum and platinum group metals showed a considerable rise from 68,926 oz. in 1948 to 87,375 oz. in 1949. Exports during the year totalled 94,094 oz. compared with 64,579 oz. in 1948, the whole going to the United Kingdom. The output of tungsten during 1949 totalled 418 tons compared with 157 tons in 1948. Exports during the year totalled 309 tons valued at £85,929, compared with 116 tons valued at £37,896 in 1948. The bulk of the exports went to the United Kingdom.

Vermiculite production showed a big increase, the output totalling 23,364 tons compared with 13,809 tons in the previous year. Exports amounted to 10,637 tons valued at £53,314, compared with 8422 tons valued at £34,221 in 1948. The U.S.A. was the principal purchaser, although considerable tonnages were shipped to Canada, the United Kingdom, and Holland, all of which took over 1000 tons of vermiculite during the year. During 1949, 29 tons of zinc blend were produced and all of it was exported to Belgium.

SOURCE OF VERSATILE COMPOUNDS

Many Uses of Meta-Benzenedisulphonic Acid

FRESH importance is being attached to meta-benzenedisulphonic acid, a new industrial chemical of special interest as an electrolyte additive for the electroplating of nickel (U.S. Patent 2,402,801). Here the acid serves to give a deposit of superior lustre, ductility and bonding power with the base metal.

In the manufacture of plastics this strong acid is finding value as an acid curing agent or catalyst for phenolic, urea, melamine and resorcinol resins, and it has been suggested as a catalyst for esterification, condensation and related acid catalysed reactions.

Potentially important resins can be made by reacting meta-benzenedithiol with poly-unsaturated compounds (U.S. Patent 2,411,954). The intermediate chemical, meta-benzenedithiol, is produced in two stages (1) by heating the alkali salt of meta-benzenedisulphonic acid with phosphorus pentachloride to form the acid chloride; (2) reduction of the acid chloride with tin and hydrochloric acid to yield dithioresorcinol (meta-benzenedithiol).

The sodium salt of meta-benzenedisulphonic acid is soluble in water and is useful as a solubilising agent for water-insoluble phenols in the preparation of disinfectants, pharmaceutical preparations and cosmetics. An old German patent, 181,288, taken out in 1907 by Friedländer discloses this process.

As Intermediate

Of importance is the use of meta-benzenedisulphonic acid as an intermediate for the preparation of dyestuffs, drugs, leather tanning agents and photographic chemicals.

In practically all reactions meta-benzenedisulphonic acid reacts as a difunctional compound and difunctional sulphonic derivatives are readily obtained. Meta-benzene disulphonamide is useful as an intermediate in the preparation of pharmaceuticals.

The disulphonamide is prepared by the treatment of the acid chloride with alcoholic ammonia (Maarse, *Rec. trav. chim*, *33*, 219 (1914) and Noelting, *Ber. 8*, 1118 (1875)). This sulphonic derivative is only sparingly soluble in water. On reaction of the disulphonamide with hypochlorous acid (Chattaway, *J. Chem. Soc.* 87, 155 (1905)) halogenated amides are formed.

Meta-benzenedisulphonic acid can be used as a starting material for the production of resorcinol (Barth and Senhofer, *Ber. 9*, 969 (1876) and Degener *J. prakt. Chem. 2*, 20, 314 (1879)). The acid is fused at a high temperature with concentrated caustic solutions to give high yields of resorcinol. Fusion of metabenzenedisulphonic acid with potassium cyanide gives isophthalonitrile (Barth & Senhofer, *Ber, 8*, 1478 (1875)).

Yields of meta-phenylenediamine can be obtained by fusing the potassium salt of the acid with sodamide (Jackson and Wing, *Am. Chem. J. 9*, 77/1887). The nitration of this strong acid with concentrated nitric acid or mixed acid gives 4-nitro-meta-benzenedisulphonic acid and 5 - nitro - meta - benzenedisulphonic acid (Heinzelmann, *Aun. 188*, 159 (1877)) from which 4-amino-benzenedisulphonic acid and the 5-amino-meta-benzenedisulphonic acid can be obtained by reduction of the nitro group.

Other interesting compounds formed include 1,3,5-benzenetrisulphonic acid, made by heating meta-benzenedisulphonic acid with concentrated sulphuric acid: meta-benzenediphenyldisulphone by reacting the meta acid with benzene in the presence of phosphorus pentoxide and meta-benzenedithiosulphonic acid (as alkali metal salt) by heating a concentrated aqueous solution of an alkali metal salt of meta-benzenedisulphonic acid with finely divided sulphor.

Meta-benzenedisulphonic acid is a grey, crystalline and highly hygroscopic compound, very soluble in water, soluble in ethyl and methyl alcohol and acetone but insoluble in hydrocarbon type solvents. This dibasic acid is highly corrosive and protective clothing and goggles must be worn when handling it in bulk.

Loss of U.S. Potash

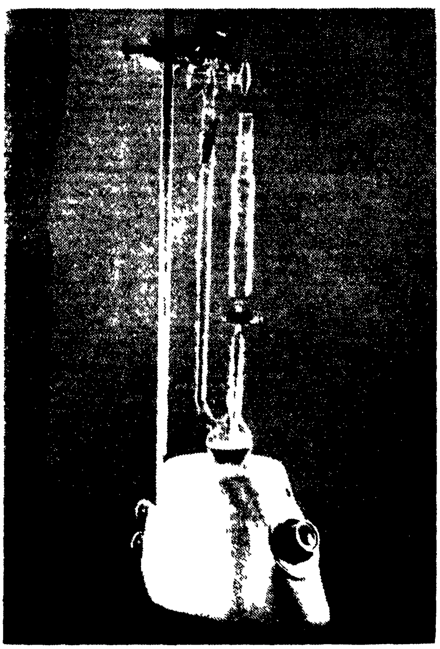
A strike in the potash mines of the Carlsbad district of New Mexico in November and December caused a decline in production and sales of potash in the U.S.A. in 1949. Production and sales totalled 2,056,609 short tons, a decrease of 81,884 from the 1948 peak of 2,138,493 short tons. Total value of sales in 1949 was $35,105,799, nearly $900,000 less than the previous year, while stocks at the end of the year fell to the low level of 9066 short tons K_2O.

PRODUCING RADIOACTIVE CARBON

Supply Ministry Exhibits at the Radiology Exhibition

FROM the industrial viewpoint, perhaps the most interesting aspect of the technical exhibition of X-ray and electro-medical apparatus held in London this week in conjunction with the sixth International Congress of Radiology was the Ministry of Supply stand, which showed the work of the radiochemical centre at Amersham. The chemists at Amersham are engaged on the production of C^{14}, which is one of the six isotopes of carbon, four of which are radioactive, the other two being C^{12} and C^{13}, which are the normally known isotopes.

C^{14} is of interest because of its wide potential applications—as a tracer to detect the distribution of carbon in steels, or to reveal the behaviour of wetting agents and detergents in mineral flotation, the lubricating and fuel properties of petroleum fractions and in many other functions.



Part of the fully enclosed synthesis apparatus in the base of which a rotating magnetic field spins a glass-coated steel agitator

The relatively simple principle involved is the same as that of the other tracer elements. A compound in which part of the ordinary carbon (the C^{12} and C^{13} isotopes) has been replaced by C^{14} is said to be "labelled" and all or part of it can be identified afterwards by its radioactive properties. Since natural carbon and C^{14} have the same chemical properties, the C^{14} can be substituted for the normal carbon in any chemical process without disturbing the system. A "labelled" compound can, of course, be followed through the most complicated chemical and biological processes, often to give information not otherwise obtainable.

Detection of Tracer

During many organic processes, C^{14} becomes diluted in a large amount of inactive carbon and thus the effectiveness of C^{14} as a tracer depends upon the sensitivity with which it can be detected. This is, in fact, extremely high. Generally, a Geiger counter, with a window to admit the soft radiation, and the usual scaling equipment, are sensitive enough to detect one part of C^{14} in ten million of ordinary carbon.

For the same reason it is important that the proportion of C^{14} in the starting material shall be as high as possible. In material from the Harwell pile the proportion of C^{14} atoms is usually between 2 and 5 per cent of the inactive carbon. Since C^{14} has a long half-life (5000 years), this ratio does not change appreciably with time.

The C^{14} is made by protracted irradiation of nitrogen. Potassium nitrate is packed into aluminium cans, each containing about 5 oz., which are inserted into the pile. It requires about one year of irradiation before the cans contain the newly formed isotope in combination with oxygen in the potassium nitrate crystals. Dilute perchloric acid is added to liberate radioactive carbon dioxide, leaving the unchanged material in solution. The CO_2 is absorbed in caustic soda and converted to barium carbonate, a compound that is conveniently stored.

It should be noted that, because the weight of C^{14} formed is very small, no carbon dioxide, either from water or from the atmosphere, must be allowed to dilute the radioactive carbon. Further,

it is imperative that the removal of the C^{14} from the solution shall be exceptionally thorough.

To remove carbon dioxide from the acid, nitrogen is bubbled through it for several hours. When no inactive CO_2 remains in the apparatus the acid is transferred to a CO_2-free flask containing about 50 cans of irradiated potassium nitrate. The radioactive CO_2 is removed in a stream of nitrogen and taken up in a glass absorption column through which caustic soda is pumped. The solution is withdrawn and the product separated by precipitation as barium carbonate.

Difficulties of Synthesis

The synthesis of C^{14} into labelled organic compounds is complicated by the following considerations:

(1) The tiny quantities of substance used.

(2) Products formed are generally volatile liquids or gases.

(3) The products are toxic and valuable.

(4) The usual convenient methods of organic synthesis do not apply.

(5) The small yield makes the testing of purity very difficult.

The first three difficulties preclude carrying out the syntheses in the usual flasks and beakers. This difficulty has been overcome by performing the entire series of operations in a totally enclosed glass apparatus from which all air has been evacuated. During the experiment, the reagents are moved from one part of the apparatus to another by condensing their vapour by extreme local cooling. The receiving limb, for example, is usually cooled in a liquid nitrogen to $-147°C.$, at which temperature most materials can be condensed quantitatively.

Losses of Material

The syntheses are often carried out in several stages, frequently with many intermediate steps. Consequently, the inevitable small losses of material at each step are accumulative. Thus, in a ten-stage synthesis, where the yield at each stage is 90 per cent, we have

$(0.9)^{10}$ approximately equals 0.348

giving an overall yield of only 34.8 per cent. Considerable effort is therefore devoted to the improvement of yields in such syntheses.

The chemical routes used in the syntheses are well illustrated in the following typical summary of the preparation of some organic compounds, all "labelled" in the methyl group.

The radioactive CO_2 liberated from barium carbonate by perchloric acid is absorbed in lithium aluminium hydride, where it is reduced to methanol. The "labelled" methanol is refluxed with hydriodic acid to produce methyl iodide. This is then agitated with aqueous caustic potash to form acetonitrile, which may then be hydrolysed with caustic soda to give sodium acetate.

Aqueous acetic acid is made from the sodium acetate by acidifying and then distilling; the acetic acid itself is converted to lithium acetate by addition of lithium hydroxide. Lithium acetate may then be pyrolysed to form acetone, which can be reduced with lithium aluminium hydride to isopropyl alcohol. By reacting this with phosphorus and iodine, isopropyl iodide is produced, and then condensed with acetamidomalonic ester to give diethyl isopropyl acetamido malonate. The condensation product is then hydrolysed with hydrogen bromide to form di-valine, again "labelled" in the methyl group:—

$$(\overset{*}{C}H_3)_2CH.CH(NH_2).COOH.$$

The usual physical measurements such as melting or boiling points, to determine the purity of the products, are not often used; it is preferred instead to rely on an analysis of the C^{14} content by radioactive measurement.

* The C^{14} atom.

French Analytical Congresses

THE Societé de Chimie Industrielle will hold its 23rd industrial chemistry congress at Milan, from September 17-23.

The branches of chemistry to be dealt with in papers at the 22 sessions are: agricultural, analytical, biochemistry, pharmaceutical, physical and general chemistry, inorganic, the chemistry of metals, organic, therapeutical, the chemistry of food, combustibles, fermentation, textile fibres and plastic materials, cements, ceramics and glass, insecticides and disinfectants, dyestuffs, fats and derivatives, explosives, essences and perfumes, chemical technology, radioactive materials.

The Societé de Chimie Industrielle, with the collaboration of the Groupement Technique de l'Analyse et des Essais, is organising a congress of analysts in Paris, from November 20-24. The congress will be divided into these five sections: laboratory apparatus, physio-chemical techniques, organic chemical analysis, mineral chemical analysis, hygiene and biochemical analysis.

Aluminium Explosion Hazards

Violent Reactions with Chlorinated Hydrocarbons

FIELD reports in the U.S.A. attributing fires or explosions caused by the reaction of aluminium with carbon tetrachloride or methyl chloride decided the Underwriters' Laboratories, Inc. to investigate.

The report which was produced recorded that tests under various conditions were conducted using magnesium powder or aluminium exposed in contact with carbon tetrachloride, methyl chloride, trichloroethylene, dichlorofluoromethane, or carbon tetrachloride-chloroform mixtures.

HAZARDS of using carbon tetrachloride and aluminium were referred to by the senior chemical inspector of H.M. Factory Inspectorate in his report on a fatal explosion which occurred at the works of the Northern Aluminium Co., Ltd., Banbury (Oxon) in May (THE CHEMICAL AGE, 63, 6).

The fact that explosions or fires may accompany the reaction of aluminium with chlorinated hydrocarbons, such as carbon tetrachloride or methyl chloride, was not unknown. In 1945 *an investigation in the U.S.A. on the "Reactions of Aluminium and Magnesium with Certain Chlorinated Hydrocarbons", was prepared by C. C. Clogston, B.S.Ch.E., physical chemist for the Underwriters' Laboratories, Inc., and published by them as Bulletin of Research No. 34.* Some of the primary facts of that investigation are abstracted here.*

Among other results the tests indicate that aluminium powder in contact with methyl chloride, carbon tetrachloride, or a carbon tetrachloride-chloroform mixture is capable of explosion; methyl chloride in contact with aluminium may form spontaneously combustible aluminium methyl.

A bomb containing aluminium powder and carbon tetrachloride exploded violently after heating to 152° C. (305.6° F.) in 58 minutes.

Fifteen tests were carried out at ordinary or moderately elevated temperatures, as follows: No. 1, aluminium turnings and carbon tetrachloride; No. 2, aluminium tubing and methyl chloride; Nos. 3-12, aluminium or magnesium powder and methyl cloride, carbon tetrachloride, trichloroethylene, or dichlorodifluoromethane; Nos. 13 and 14, aluminium powder and carbon tetrachloride or trichloroethylene (vapour phase); No. 15, aluminium powder and carbon tetrachloride (heated).

With the exception of test No. 1, results are summarised in Table 1. During the boiling of the carbon tetrachloride in the first test, the aluminium turnings became black and rough, with a corroded appearance. The carbon tetrachloride gradually acquired a purple colour, states the report, and after boiling for 25 minutes, the action became self-sustaining: that is, the boiling and refluxing continued for half-an-hour without application of external heat.

Rate of Reaction

The temperature of the liquid gradually increased, refluxing beginning at a temperature of 72.5° C. (162.5° F.) and increasing to 88° C. (190.4° F.) after an hour. After the first hour, no further reaction was evident. The boiling temperature increased slightly with time, the maximum being 90° C. (194° F.)

The results of the tests indicated, in addition to the primary findings already mentioned, that at ordinary temperatures (29.4° C. or 85° F.) and in the presence of a small amount of aluminium chloride as a catalyst, aluminium powder and methyl chloride reacted, first with the gradual formation of gaseous pressure in a closed bomb, and after 41 days with more rapid pressure rise to more than 1800 p.s.i. (see Test No. 4). The residue from the reaction readily ignited spontaneously on contact with air or water, and burned especially vigorously on water.†

While aluminium chloride, a catalyst, was present in the test to accelerate reaction, it must be remembered that aluminium chloride is a product of the reaction, and the reaction is, therefore, autocatalytic. This would indicate that in the initial absence of aluminium chloride, the reaction might eventually occur, though it would be expected to

* Underwriters' Laboratories, Inc., 207, East Ohio Street, Chicago, 11.

† This behaviour is characteristic of aluminium methyl, and indicates the presence of this compound in the residue. The formation of this compound has been noted by others (*see Ansul News Notes*, Vol. 1, No. 2, of Ansul Chemical Co., Marinette, Wis.).

TABLE 1

TESTS IN BOMBS AT ORDINARY OR MODERATELY ELEVATED TEMPERATURES

Test No.	Contents of Bomb (Powdered Metals Used)	Temperature Deg. C.	Temperature Deg. F.	Gauge Pressure (P.S.I.)	Duration of Test, (Days)	Results
2	45 g CH_3Cl	29.4	85.0	79	90	No appreciable reaction.
3	60-70 g Al, 140-220 g CH_3Cl	29.4	85.0	79	65	Small volume of H_2 formed; no other appreciable reaction.
4	Same as Test No. 2+0.5 g $AlCl_3$	29.4	85.0	79 to more than 1800	41	Gradual pressure increase to 128 p.s.i. above vapour pressure of CH_3Cl, a more rapid increase to more than 1800 p.s.i. with rupture of disc followed by spontaneous combustion of escaping gases. CH_4 and a spontaneously combustible residue of $Al(CH_3)_3$ were left in bomb.
5	60 g Al, 80 ml CCl_4-$CHCl_3$ mixture†	29.4	85.0	0 to more than 1800	47	Reaction with pressure increase to more than 1800 p.s.i. rupture of disc, and spontaneous combustion of escaping gases. C, $AlCl_3$, and $COCl_2$ formed.
6	Same as Test No. 5+0.5 g $AlCl_3$	29.4 to 43.3	85.0 to 110.0	0 to more than 1800	35	Same as for Test No. 5
7	112 g Mg, 110 ml CCl_4-$CHCl_3$ mixture†	29.4 to 43.3	85.0 to 110.0	0	69	Slight reaction, traces of chlorides and of acids formed.
8	195 g Mg, 295 g CH_3Cl ...	43.3	110.0	118 to 0	133	Slight reaction, some $MgCl_2$ formed.
9	60 g Al, 136 g CCl_2F_2 ...	43.3	110.0	140 to 0	84	Slight reaction, some $AlCl_3$ formed.
10	60 g Al, 132 g CCl_2F_2, 0.1 g H_2O	43.3	110.0	130 to 0	130	Slight reaction; $AlCl_3$ formed in small amounts.
11	60 g Al, 80 ml CCl_4 ...	43.3	110.0	0	250	Some $AlCl_3$ formed, and also small volumes of CO_2, CO, H_2 and CH_4.
12	60 g Al, 100 ml C_2HCl_3 ..	43.3	110.0	0	150	Slight reaction; traces of acid and chlorides found in darkened liquid.
13	60 g Al, 80 ml CCl_4 ..	33.0 to 43.3	91.4 to 110.0	0	250	Some reaction; liquid became slightly acid, contained some chlorides and yellow organic solid. $AlCl_3$ formed.
14	6p g Al, 100 ml C_2HCl_3 ..	33.0 to 43.3	91.4 to 110.0	0	150	Slight reaction; traces of chlorides formed in metal and in liquid.
15	60 g Al, 110 ml CCl_4 ...	17.0 to 152.0	62.6 to 305.6	0 to more than 1800	53 min.	Reacted with sudden and violent explosion, rupturing bomb. $AlCl_3$ and C formed.

† 8.3 per cent by volume $CHCl^3$.

occur more slowly. Thus, under similar conditions, in the absence of aluminium chloride, no reaction of aluminium powder and methyl chloride occurred in 65 days, except possibly the formation of a small amount of hydrogen (see Test No. 3).

When maintained at only slightly elevated temperature (from 29.4° to 43.3° C. or 85° to 110° F.) for 35 and 47 days, aluminium powder in contact with carbon tetrachloride containing some chloroform (8.3 per cent by volume) reacted with pressure in excess of 1800 p.s.i., and with flame, forming carbon and aluminium chloride (Tests No. 5 and 6).

Powdered aluminium ignited promptly and burned in the vapour of such a carbon tetrachloride-chloroform mixture at one atmosphere pressure, and at a temperature of 286° to 312° C. (547° to 594° F.), (Test No. 22).

Powdered aluminium and carbon tetrachloride heated together in a bomb at constant volume under the vapour pressure of carbon tetrachloride suddenly exploded at 152° C. (306° F.), rupturing the bomb and forming aluminium chloride and carbon; large volumes of light grey smoke were present (Test No. 15).

At lower temperatures (43.3° C. 110° F.) powdered aluminium and carbon tetrachloride vapour were heated together in

TABLE 2

TIME-TEMPERATURE-PRESSURE DATA DURING HEATING OF ALUMINIUM POWDER AND CARBON TETRACHLORIDE IN BOMB (Test No. 15)

Time Min.	Temperature of Bomb Deg. C.	Temperature of Bomb Deg. F.	Calculated Pressure, P.S.I. Gauge, Based on Vapour Pressure and Air Expansion	Reading of Gauge on Bomb P.S.I.
0	17.0	62.6	0.0	0
5	17.0	62.6	0.0	0
10	21.0	69.8	0.7	0
15	27.0	80.6	1.4	0
20	36.0	96.8	3.0	0
25	52.0	125.6	7.0	0
30	68.0	154.4	12.0	0
35	87.0	188.6	22.0	0
40	108.0	226.4	38.0	25
45	126.0	258.8	57.0	45
50	143.0	289.4	82.0	65
53	152.0	305.6	97.0	Explosion

A NEW MONOMER FOR THERMOPLASTICS

Interesting Characteristics of 2-Vinyl Pyridine

THE possibility of synthesising new resins is suggested by the recent development of 2-vinyl pyridine. This monomer, which is characterised by its pungent odour, is soluble in water to the extent of about 2.5 per cent and freely soluble in dilute aqueous acid solutions. It dissolves in all the common organic solvents, such as aromatic and aliphatic hydrocarbons, alcohols, ketones, esters, etc.

The monomer polymerises at room temperature to form hard and tough transparent thermoplastic resins. Normally an inhibitor is present to prevent premature polymerisation, but the inhibitor can be eliminated by vacuum distillation. Ultra-violet light hastens polymerisation, as do catalysts (or activators) such as benzoyl peroxide in percentages of 1-2.

If polymerisation of 2-vinyl pyridine is carried out at elevated temperatures (the monomer boils with resinification at about 159° C. at 760 mm. Hg.) a viscous resin is formed. In common with many other well known monomers, 2-vinyl pyridine can be polymerised if emulsified with an aqueous solution of ordinary soap, sodium oleate and other emulsifying agents (5-10 per cent strengths are usual) using a peroxide catalyst, *e.g.*, benzoyl peroxide or lauryl peroxide.

The polymerised material is soluble in most common organic solvents and it is considered likely that such solutions might be of interest as coatings and adhesives. Dilute aqueous mineral acids convert the resin into a highly viscous solution.

Of particular interest is the fact that 2-vinyl pyridine can be co-polymerised with butadiene and styrene to give elastomeric resinous products possessing useful properties. These have not yet been fully investigated, so far as recent publication indicates, but they promise to be of interest for applications not unlike those of polyvinyl chloride and polyvinyl chloride acetate.

2-vinyl pyridine has so far only been produced in development quantities for market appraisal by the chemical industry. Reilly Tar and Chemical Corporation, Indianapolis, U.S.A., has taken a prominent part in pioneering this monomeric chemical.

Considerable care is necessary in handling 2-vinyl pyridine, which, like most other volatile pyridine derivatives, possesses lachrymatory properties. The liquid will cause blistering of the skin in a few minutes.

This new chemical is very reactive. It can be readily oxidised, as with potassium permanganate, to give picolinic acid. Hydrogenation gives ethyl pyridine and 2-ethyl piperidine. With acids the monomeric compound yields hygroscopic salts which are soluble in water but insoluble in most organic solvents.

ALUMINIUM EXPLOSION HAZARDS

(continued from previous page)

a bomb for more than eight months with no reaction other than some formation of aluminium chloride in the aluminium powder and a small amount of yellow organic solid dissolved in the carbon tetrachloride. At this temperature, however, contact of liquid carbon tetrachloride with aluminium powder resulted in the formation of larger amounts of aluminium chloride in the aluminium, and various gases, including carbon dioxide, carbon monoxide, gases absorbed by sulphuric acid, hydrogen, and methane (Tests No. 11 and 13).

At temperatures of the order of 400° C. (752° F.), aluminium powder ignited and burned in dichlorodifluoromethane at one atmosphere pressure, aluminium chloride, free carbon (and probably aluminium fluoride) being formed. However, powdered aluminium in contact with dichlorodifluoromethane at a temperature of 43.3°C. (110° F.) for $4\frac{1}{3}$ months caused only the formation of small amounts of aluminium chloride without building up pressure, or producing other marked evidence of reaction (Tests No. 10 and 27).

No marked reaction occurred between powdered aluminium and trichloroethylene, either when heated at temperatures up to 427° C. (801° F.) or when maintained in contact for five months at 43.3°C. (110°F.) Similiar negative results were obtained with magnesium and methyl chloride in contact in a bomb at 43.3° C. (110° F.) for $4\frac{1}{2}$ months, or a carbon tetrachloride-chloroform mixture containing 8.3 per cent by volume chloroform in contact with powdered magnesium for more than two months (Tests No. 7, 8, 12, and 25).

Upon receiving hammer blows in the impact tests, aluminium or magnesium with carbon tetrachloride, chloroform, or trichloroethylene did not readily explode.

Elastic Materials Research

Mellon Institute Developments in 1949

TWO of many interesting researches carried out at the U.S. Mellon Institute during 1949 were concerned with elastic materials. The first of these, dealing with the reinforcement of rubber by pigments, was the task of the Rubber Fellowship, sponsored by the Firestone Tyre Co., of Ohio.

An initial project was designed to ascertain the effects of various rubber pigments upon the consistency of high-solids filler-liquid pastes. It was disclosed that, for a series of carbon blacks suspended in mineral oil, the yield points at equivalent concentrations of the blacks were proportional to the inverse squares of their particle diameters.

Calcium Carbonate

This relationship demonstrates qualitative correspondence to the well-known increased reinforcing powers of the smaller diameter blacks. For all the pigments studied, the "consistency" of the paste was found to increase as the fourth power of the volume concentration.

It has also been determined that non-black pigments, such as calcium carbonate, stiffen mineral oil pastes to about the same degree as a carbon black having equivalent particle diameter. But, when other liquids, such as linseed oil, are used as media, calcium carbonate pigments produce suspensions of very much lower consistency than carbon black dispersions possessing equivalent concentration. Moreover, fatty acids lower greatly the stiffness of a calcium carbonate, but not of a carbon black paste.

It is felt that some of these findings may contribute to expounding the mechanism of the reinforcement of rubber by carbon black.

The second of these researches had for its object an improvement in the physical properties of the rubber-like silicone, or Silastic. Both tensile strength and elongation have been greatly improved, and the tear resistance has been increased three-fold.

Silicone treatments for the waterproofing of textiles have been developed and are already coming into commercial use. A treatment of paper has resulted in a product that is extremely water-repellent and that prevents the adhesion of pressure-sensitive tapes, rubber, asphalt, and many other normally adhesive materials.

In the electrical field, a silicone bonding enamel for glass-served magnet wire has been developed. There have also been improvements during 1949 in silicone lubricants for use at both high and low temperatures. An entirely new line of silicone intermediates for use in resins and paints has been evolved.

The silicone product for controlling foam in aqueous systems is one that finds the broadest diversification of employment. It is accepted for use in edible products at its effective range of concentration, *e.g.*, up to 10 p.p.m. It controls foaming during wine fermentation, and is generally effective in trace amounts for preventing foam in such widely different media as antifreeze solutions and oxygenated blood. It also relieves cattle suffering from tympanites or bloating.

The descriptions of these researches appear in the 87th annual report of the director of the Mellon Institute, Pittsburgh, U.S.A. Other aspects of Mellon Institute research have been reviewed briefly (THE CHEMICAL AGE, 62,

WELDING RESEARCH

Laboratories for BWRA

PLANS to increase its laboratory space and install the modern testing equipment were outlined at the fifth annual general meeting of the British Welding Research Association held at Abington, near Cambridge, on July 13.

The paramount necessity of keeping its equipment up-to-date was emphasised by the council, which announced that a pulsating pressure testing plant for fatigue testing pressure vessels had been installed and a large tensile testing machine had been ordered.

These large and expensive equipments, however, demanded considerable laboratory space and the council was therefore planning to build a fatigue testing laboratory at Abington, thus releasing a portion of the old laboratories for much needed expansion of other work. The new laboratory would cost in the neighbourhood of £20,000—much more than the association could spare from its reserves, and an appeal for support would have to be made.

During the past year much valuable work had been undertaken by the research board, and the liaison department had been reorganised.

ORGANO-LITHIUM COMPOUNDS

A Survey of Recent Developments

by R. W. MONCRIEFF

UNTIL fairly recently the greatest claim that lithium had to the organic chemist's attention was that its urate was moderately soluble in water; thus, lithia water was prescribed for the treatment of gout and similar ailments, supposedly caused by the lodgment of uric acid crystals in the joints.

To-day, matters are very different indeed and a great number of organic lithium compounds are used. Ordinarily they are not end products, but intermediates designed to assist a synthesis in a similar way to that in which magnesium Grignard agents are so successful as intermediates, but of little interest *per se*.

Delayed Introduction

It is perhaps one of the most surprising features of the chemistry of the organo-lithium compounds, that their introduction and use were so long delayed. For many reactions magnesium was too sluggish to be useful, and the substitution of a light alkaline earth metal by an alkali metal must have seemed the obvious step to take in order to obtain the desired increase in reactivity. Why was this step not taken earlier? The probable reason is that the alkali metals, particularly sodium, were well known to convert alkyl and aryl halides into hydrocarbons; this was, of course the well-known Wurtz-Fittig reaction and one of the standard methods of preparing hydrocarbons.

In 1855, Wurtz[1] had reacted sodium with ethyl iodide to form butane:

$$2C_2H_5I + 2Na \rightarrow C_4H_{10} + 2NaI.$$

In 1864, Tollens and Fittig[2] applied the same method to the preparation of the homologues of benzene, *e.g.*, bromobenzene and methyl iodide react, to give toluene:

$$C_6H_5Br + CH_3I + 2Na \rightarrow C_6H_5.CH_3 + NaBr + NaI.$$

It was only much later, in 1930, that Ziegler and Colonius[3] established that when metallic lithium was reacted with alkyl or aryl halides, the organo-lithium derivatives are formed in good yield, according to the equation:

$$RBr + 2Li \rightarrow RLi + LiBr.$$

Using similar symbols, the Wurtz-Fittig reaction may be represented as follows:

$$2RBr + 2Li \rightarrow R-R + 2LiBr.$$

How are these reactions reconciled?

The answer is that Wurtz-Fittig reaction proceeds in two stages and the organo-metallic compound is an intermediate. The first stage is:

$$RBr + 2Li \rightarrow RLi + LiBr \quad ...... \quad (1)$$

and this is followed by the reaction between the organo-metallic compound RLi and some of the unchanged halide, thus:

$$RLi + RBr \rightarrow R-R + LiBr \quad .. \quad (2)$$

Adding the two equations (1) and (2) we arrive at:

$$2RBr + 2Li \rightarrow R-R + 2LiBr,$$

which is the equation for the Wurtz-Fittig reaction.

When sodium or potassium was used as the alkali metal, the second stage followed so quickly on the first, that it was not realised that the Wurtz-Fittig reaction proceeded through the intermediate organo-metal compound. When lithium is used it is considerably less active than either sodium or potassium, and it is therefore possible to detect the formation of the organo-lithium compound. Ziegler and Colonius found, in fact, that the lithium derivatives are formed in good yield, because they react only slowly with the organic halide still present.

Although the reactivity of the organo-lithium compounds is much lower than that of the corresponding sodium and potassium compounds, it is nevertheless greater than that of the organo-magnesium compounds. The order of reactivity is

$$RK > RNa > RLi > RMg(Br).$$

Gilman and Young showed that the caesium and rubidium organo compounds were even more reactive.

The greater reactivity of the alkali metal compounds, as compared with those of magnesium opens up the possibility of using new syntheses, *e.g.*, alkali metal compounds are capable of adding to an ethylene linkage, whereas magnesium compounds are not. Thus, Gilman and Kirby[9] showed that benzophenone-anil $(C_6H_5)_2C:NC_6H_5$ "reacts decidedly slowly, if at all, when refluxed with phenyl magnesium bromide in ether." But phenyl-lithium will react with benzophenone-anil in ether and the product obtained is triphenylmethylaniline:

$$(C_6H_5)_2C:NC_6H_5 + C_6H_5Li \rightarrow (C_6H_5)_3CNHC_6H_5.$$

In addition to this general difference of

degree of reactivity, there are also differences in the kind of reactivity. Thus, Gilman and Bailie[4] showed that, whereas magnesium derivatives reduce azobenzene to hydrazobenzene (plus a small proportion of aniline), the potassium derivates will add on to it, *e.g.*, phenyl-potassium adds unsymmetrically to azobenzene to give triphenylhydrazine. In this instance lithium behaves like magnesium and, by symmetrical addition to the azo linkage, gives mostly hydrazobenzene:

$$C_6H_5N:NC_6H_5 + 2C_6H_5Li \rightarrow C_6H_5.C_6H_5 + \underset{Li}{C_6H_5N}-\underset{Li}{NC_6H_5} \xrightarrow{H_2O} C_6H_5NH.NHC_6H_5$$

On the other hand, triphenylhydrazine results by unsymmetrical addition of the highly reactive phenyl-potassium.

$$C_6H_5N:NC_6H_5 + C_6H_5K \rightarrow (C_6H_5)_2N.\underset{K}{N}C_6H_5 \xrightarrow{H_2O} (C_6H_5)_2N.NHC_6H_5$$

The greater reactivity of organo-lithium compounds requires that reactions in which they are used must be carried out in an inert atmosphere, whereas the corresponding magnesium derivatives do not need this protection. Cylinder nitrogen, provided it is dried by calcium chloride and phosphorus pentoxide, is a suitable gas to use as an inert atmosphere; the traces of oxygen that such nitrogen contains will not, as a rule, interfere.

While lithium will react with a variety of compounds, the most suitable are the halides. These must be carefully purified; whereas bromobenzene reacts readily with lithium, the presence of dibromobenzene as an impurity greatly retards the reaction.

Choice of Halides

The bromide is the halide usually preferred; iodides are ordinarily too reactive, since they react rapidly with the alkyl-lithium, so that the organo-lithium compound cannot be isolated, and the reaction goes straight through to the normal Wurtz-Fittig. An exception is methyl iodide, which will give an 80 per cent yield of methyl-lithium in ether solution. The chlorides are less reactive than the bromides; they can be used in the aliphatic, but not in the aromatic series.

The reaction between the halide and the lithium must be carried out in solution in an inert solvent. Ether is generally used, while benzene and cyclohexane are possible alternatives. Though ether accelerates the preparation and reactions of organo-lithium compounds, benzene and cyclohexane slow them down. Accordingly benzene and cyclohexane are most suitable for use in the alkyl series where also the chlorides are sufficiently reactive to be used. In the aromatic series, however, reactivity is so much less that bromides are used with ether as a solvent. It is thus possible to enhance or depress the reactivity of lithium with the halide in two ways: (1) by choice of halide, iodide being more reactive than bromide and bromide more reactive than chloride, and (2) by choice of solvent, ether encouraging the reaction, benzene suppressing it.

A three-necked flask with stirrer, dropping funnel and reflux condenser is a suitable apparatus. A nitrogen atmosphere is maintained, and ether is introduced into the apparatus, followed by the lithium. The metal should be in a form that has a considerable surface; either in flat fragments or as a thin ribbon cut into pieces. When the ether and the lithium are in the reaction flask, a solution of the halide in ether is added. Only a little is put in at first, the rest being allowed in at a rate sufficient to maintain gentle refluxing. When all of the halide has been added, and spontaneous refluxing has ceased, heating is continued for about an hour. The mixture is then allowed to settle and the supernatant liquid transferred to a vessel fitted with a burette.

Determination of Organo-Lithium

The organo-lithium content of the ethereal solution is determined by taking the difference between two titrations.

(1) A known volume of the ethereal solution of the organo-lithium compound is run from the burette into a little water. The lithium immediately forms lithium hydroxide, which is titrated with standard acid using methyl orange as an indicator. This gives the total lithium, most of which will have been present as organo-lithium compound but some, possibly, as lithia from contact with moisture, or as lithium ethoxide from partial decomposition of the ether.

(2) A second aliquot portion of the ethereal solution is coupled with benzyl chloride and the lithium hydroxide and ethoxide in the solution then titrated against standard acid. The difference between the titres is a measure of the organo-lithium compound originally present.

Often the organo-lithium compounds are formed in a yield of 75-95 per cent based

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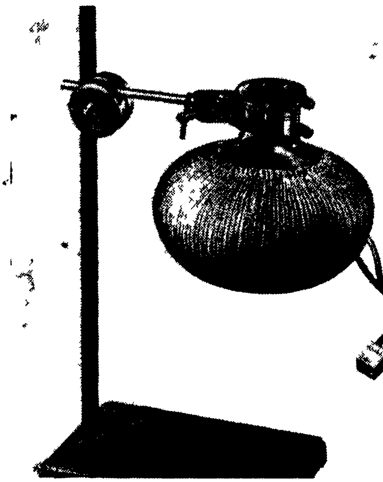
Electrothermal Heating

New Flexible Glass Fabric Mantles

A NEW series of electrothermal heating mantles designed to meet the need for a light entirely flexible type of heater is now available as an addition to the range of electrothermal aluminium housed mantles and laboratory heating equipment.

This development by Electrothermal Engineering, Ltd., has now reached production stage. The flexible mantles (series MJ) are constructed entirely of glass yarn capable of resisting temperatures up to 550°C., while some special types permit temperatures up to 750°C. to be used.



A flexible heating mantle with elastic neck entry

The flask is inserted into the close-fitting mantle neck; elasticity is imparted to the neck by the combined action of a stainless steel spring and the knitted glass fabric. The elastic nature of the mantle enables either flat or round bottomed flasks and flasks of wide tolerance to be used.

The construction makes the mantle self-adhering to the flask, at the same time providing excellent heat transfer with minimum heat losses incorporated in one piece of equipment. Accuracy of heat control is attained by the use of external energy regulators which reduce the energy input on a proportionate time basis.

Standard sizes of mantles range from flask capacity of 50 to 10,000 millilitres.

Mantles operating at temperatures above 550°C. are not necessarily covered by the test on fire hazards described in the Joint Fire Research Organisation report No. 50.

Australian Industrial X-ray Unit

Precise measuring and optical instruments, which before the war were imported into Australia, are now being made there. A Melbourne company manufactures an industrial X-ray unit, with a range of 30 to 140 kV.P., used for the examination of high alloy castings.

ORGANO-LITHIUM COMPOUNDS

(continued from previous page)

on the halide used. Their solutions in benzene or in cyclo-hexane are stable, but ethereal solutions are less stable on account of the tendency of alkyl-lithium compounds to decompose the ether, with the formation of lithium alkoxides.

The above method of estimation is partly due to Ziegler, Crössmann, Kleiner and Schäfer[7] who obtained true titration values by the difference between the titres of two aliquots (1) for the total alkali metal and (2) for the alkali metal after destroying the RLi compound by adding *n*-butyl bromide and then dibenzylmercury. The benzyl-lithium formed by reaction of the RLi compound and dibenzylmercury was at once decomposed by the butyl bromide.

Gilman and Haubein[5] showed, however, that benzyl chloride was a more convenient reagent than the *n*-butyl bromide-dibenzylmercury combination for removing the RLi compound. The alkyl-lithium compounds couple so readily with benzyl chloride that there is no unchanged alkyl-lithium present within one half-minute after mixing the two solutions.

(*To be continued*)

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OVERSEAS CHEMISTRY AND INDUSTRY

India's Aim of Self-Sufficiency

Government's Closer Control of Imports

From OUR CORRESPONDENT

FURTHER evidence is accumulating of unrest in some industries resulting from the increasing development of the Indian Government's policy of securing tighter control of imports, of some basic production processes and of raw materials. The rigid limitation of imports in particular has limited operations in a number of industries and shortage of supplies has tended to produce price increases.

Salt imports to India during the first six months of this year amounted to three million maunds, which together with an anticipated production of 65 million maunds will equal the estimated requirements of the country for the year. The Government has therefore banned the import of salt in the second half of the year.

Self-Sufficiency by 1951

Production of salt has increased in all parts except Travancore, where producers are stated "to have lost all interest" in the industry in view of the Travancore Government's move for nationalisation. Factories in the State have now been taken over by the Government of India.

According to official forecasts, India expects to attain self-sufficiency in salt by the end of this year, a year ahead of the target date of 1951. Meanwhile, the Governments of India and Pakistan have agreed to allow the import of rock salt to India from Pakistan freely without any licensing or payment restrictions.

All stocks of uranium available in the country are to be purchased by the Government of India. This announcement was made recently at New Delhi by the Department of Scientific Research, which is controlled by the Prime Minister, Pandit Nehru.

An Atomic Energy Commission has been established to carry on researches in the application of nuclear fission to constructive purposes. Dealers and mineowners have been asked to contact the commission and send samples of uranium for analysis. Prices paid will be based on the uranium content of the ores or concentrates.

Glass manufacturers have been called upon by Mr. Shri Prakasa, Minister of Commerce, Government of India, to co-operate in the co-ordination of import, production and distribution of glass so as to eliminate monopoly and ensure equitable distribution.

The Minister was replying to representations made by the All India Glass Manufacturers' Association, urging the Government to terminate the use of the import policy as a means of protection to the glass industry.

Profiteering

According to the association, restricted imports, recommended by the Indian Tariff Board and implemented by the Government, are being exploited by the indigenous industry as an opportunity for profiteering. The association urged a thorough investigation into the working of the local industry.

The import policy of the Government and the recommendations of the Indian Tariff Board on the glass industry were also discussed at the fourth conference of the South Indian Glass Manufacturers' Association. Mr. M. V. Gopal Chettiar, secretary of the Salem District Chamber of Commerce, who presided, stressed the need to improve the technique of production while maintaining costs as low as possible. It was also resolved to request the Indian Standards Institution to study the establishment of recognised standards and see that products which attained the required specifications bore the mark of the institution.

Freer Metal Imports

The import of virgin metal and scrap as well as semi-manufactured goods such as are not manufactured in India will, in most cases, be licensed freely from dollar and soft currency areas. This is one of the main features of the Government of India's licensing policy and procedure in respect of import of non-ferrous metals from countries other than Japan for the period July-December, 1950, according to a Commerce Ministry Press note issued from New Delhi. Licences will first be issued on a provisional basis, valid for a period of six months, and will be confirmed on production of evidence of the placing of orders and their acceptance by the suppliers.

GERMAN GLASS & LABORATORY SUPPLIES

Further Impressions of the ACHEMA Displays

From A SPECIAL CORRESPONDENT

ANY doubt regarding the determination of German suppliers of chemical equipment to regain their important position in the international sphere will not have survived a visit to the ACHEMA exhibition, which reached its conclusion in Frankfurt last week (THE CHEMICAL AGE, 63, 113-14).

The lesson which is most evident, especially perhaps in the large chemical instrument sections, is that tremendous effort has has been made to offset the great handicaps imposed by wartime destruction and, no less important, the virtual isolation for some ten years from advances made in most other industrial countries.

The economic setting in which this is presented is one of extreme austerity and great seriousness of purpose. Everywhere the exhibition has been treated as being of the highest importance.

Viewed against this background, the exhibition represents a remarkable achievement. Although not reaching the level of scientific development seen at recent exhibitions in this country and in the U.S.A., the average standard of the material presented is very high and many interesting new adaptations or fresh applications of otherwise well-known apparatus have been shown.

A corner of the exhibition in which German development of large-scale metal fabrications was strikingly represented

Sixty-Five Exhibitors

Sixty-five makers of laboratory equipment, including about half a dozen from Liechtenstein, Switzerland, Austria and Denmark and several from the Eastern Zone of Germany exhibited a very wide range of equipment (Hall V).

General Glassware.—Among the many exhibits in the usual range of glassware was a well designed flask with protective reinforcement mounted in a special metal bath for work on materials liable to be explosive (Ernst Haage, Mühlheim a/R.). The same firm also exhibited some "unit" apparatus for narrow range fractionations on normal and micro scale, and some very compact compressed air motors for various uses. The Jenaer Glassworks of pre-war fame were represented both by the company still operating in the Eastern Zone (Schott & Gen., Jena) and by the new company founded in 1945 in Bavaria (Jenaer Glasswerke Schott & Gen., Landshut). Both showed the usual range of large and small scale glass equipment and optical glasses. The Jena firm, however, has a new type of coupling for glass pipe lines (*Bundrohrleitungen*) making use of a one-piece Al/Zn casting held in place by a single screw clip. A newcomer in this field was the firm of Neue Glashütte Papenburg, H. A. Fritsche, Papenburg (Ems). This was built up during the last two years by a group of specialists forced to leave the Eastern Zone of Germany and specialises in scientific glassware for particular applications.

Optical Apparatus

A very large number of the exhibitors showed optical apparatus, mostly of standard design and with few improvements of the 1937 models. Some excellent X-ray equipment was shown by the Röntgenwerk C.H.F. Müller Aktiengesellschaft, Hamburg, 1, which also created considerable interest by demonstrating the use of the only Philips electronmicroscope in Germany.

The new Zeiss works (Zeiss-Opton, Oberkochen) was built up from a nucleus staff of 80 emigrants from the Eastern

Zone works at Jena. On their stand one saw a number of very well finished colorimeters, refractometers and other items of optical equipment, among which the most interesting was a stereo-microscope. This instrument, suitable for magnifications of x6-160, is fitted with a dial operated means for adjusting magnification over five ranges without changing objectives or oculars. It has a very long viewing distance (95 mm. at x80).

Ultrasonic Apparatus

Among the many exhibits of more or less standard design in the department of electrical and sundry physico-chemical equipment were some interesting developments in ultrasonic apparatus (Atlas Werke, A.G., Bremen, and H. Propfe K.G., Mannheim), high-vacuum equipment (DEGUSSA, Frankfurt, and Gerätebau-Anstalt Balzers, Liechtenstein) and an electropolishing apparatus for photomicrographs (H. Struers Chemiske Laboratorium, Copenhagen).

An outstanding feature of the vacuum equipment shown was its very compact construction; in many cases pressure gauges and control devices were an integral part of the body castings, conferring the additional advantage of avoiding some of the usual sources of leakage. The display of pH meters was, on the whole, rather disappointing in comparison with some of the equipment now available in this country.

Analytical balances were shown by 11 firms, the models ranging from the simplest to the most complex micro and automatic balances. The Bunge microbalances of pre-war fame were very much in evidence, again showing excellent workmanship.

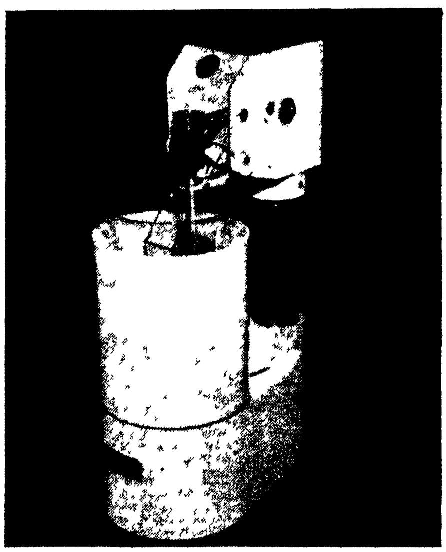
Automatic Balance

The Sartorius-Werke, Göttingen, showed their latest model, the Selecta. This is a fully automatic, aperiodic balance of unusual design with a circular case. All the controls are accessible by one hand at table level, the optical system uses elliptical mirrors to reduce light losses, so that a very low-wattage bulb, with little heating effect, can be used. The cylindrical glass walls of the case slide effortlessly in circular guides.

Another improvement in design is shown by a balance exhibited by August Sauter K.G., Ebingen. This has a projection scale across the full width of the balance case (scale length 300 mm.), electrical damping and shows the sum of the ring-weights in use on a dial immediately next to the projection scale. The same firm also shows some very pleasing torsion balances (air-damped) covering 0-1 mg. to 0-2500 mg. with 11 standard models.

The recent tendency towards single-pan balances is also evident here, the best example probably being the new model exhibited by Wilh. Spoerhase, vorm. Staudinger & Co., Giessen. It is of the constant-load type, *i.e.*, the balance is always preloaded to 100 g. (empty); weights are removed by the automatic device according to the weight on the pan which is suspended from the same lever-arm. All the mechanism is enclosed in the dust-proof main body of the case, only the single pan coming out into the all-glass front weighing compartment. Sensitivity is 0.1 mg., and maximum capacity 100 g.

It was interesting to note the general tendency in constructing laboratory furniture to use tiled tops for nearly all benches, fume-cupboards, etc., due to the scarcity of the materials more commonly used here, such as teak and special sheet materials. One noticed only one new development: a "streamlined" fume-cupboard with curved front. This is claimed to give considerably improved fume removal, and has the additional advantage of being usable in relatively low rooms, as the counter-balanced front slides over the top, like a roll-top desk.



The function of this compact assembly is to measure the digestibility of coatings to be used with pharmaceutical goods (Ing. Georg Nold)

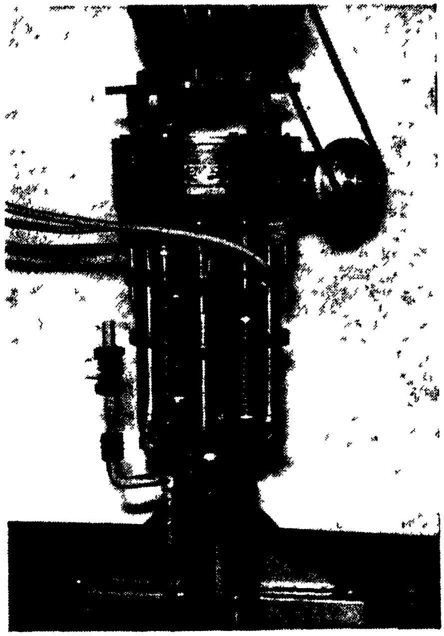
("RUMA"-Abzug: Rudolf Mauer, Frankfurt a/M.) Fume extraction in general was by relatively small, high-speed centrifugal fans of normal construction.

Among the hundreds of interesting items of laboratory equipment it is possible to mention only a few. A very compact thermostat, adjustable to 0.01°C., and said to be constant to 0.005°C. with a bath capacity of 8 litres, and fully compensated connections for separate instruments, was shown by Gebr. Haake, Medingen bei Dresden. By the same firm also were a "cold-accumulator" suitable for use with this thermostat for work at low temperatures (chargeable with ice or solid CO_2), and some very elegant equipment for electrolytic analyses.

Gas Detection

The Drägerwerke, Lübeck, gas-testing device is suitable for the detection and determination of low concentrations of CO, Hg, H_2S, C_6H_6, "nitrous" fumes, etc. A known volume of contaminated air is drawn through small glass tubes containing a suitable reagent absorbed on silica-gel or aluminium oxide. The induction is by a double-acting plunger pump of constant delivery, unaffected by back-pressure caused by the different contents of the various types of tubes.

The tubes have separate filter sections to reduce unwanted side-reactions and can be stored almost indefinitely without loss of sensitivity as they are completely sealed in, and the glass tips are broken only immediately before use. The pump, a selection of tubes, comparison standards, etc., are housed in a compact carrier.



Diaphragm dosing apparatus showing quadruple glass pumps (Ing. Georg Nold)

Other items of interest in this section of the exhibition were an automatic calorimeter which can be coupled to a chart recorder (J. H. Reinecke, Bochumm, Bad Lippspringe), a really silent shaker

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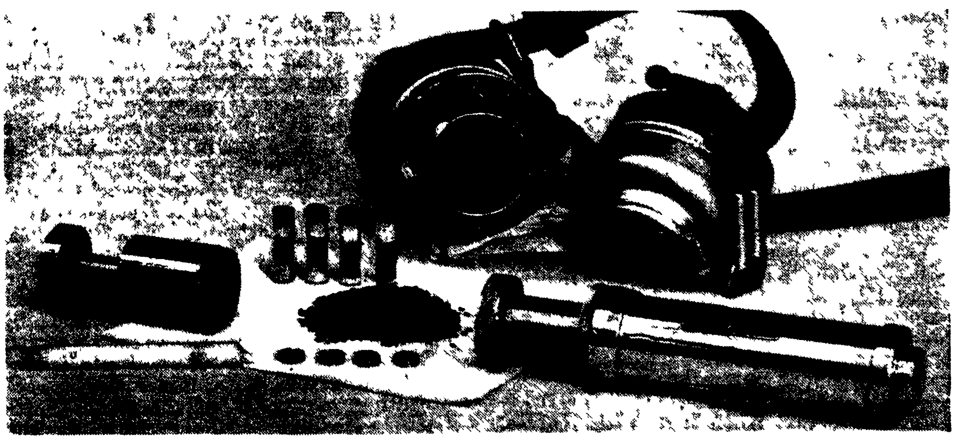

Gas testing equipment (Drägerwerke), of which the opened carrier shows the tubes and the recess for the pump

Rising Production Capacity

Evidence of the Census Returns

THE very marked increase in the value of industrial output since the pre-war period finds fresh evidence in the summaries which have now been issued, presenting the preliminary results of the census of production of 1948.

The ink trade, seed crushing and oil refining, the glue, gum, paste and allied trades steel sheets and tinplate, wallpaper and hair and fibre production are the subjects briefly reviewed in the *Board of Trade Journal* (*159*, 198) and the output figures for 1948 in each case make an arresting contrast with the 1935 and 1937 values. Typical comparisons were in the three industries represented below.

	Printing and Writing Inks			Seed Crushing and Oil Refining			Glue, Gum, Paste, Etc		
	1948 £'000	1937 £'000	1935 £'000	1948 £'000	1937 £'000	1935 £'000	1948 £'000	1937 £'000	1935 £'000
Value of production (gross output)	6,783	3,134	2,937	24,525	35,400	26,531	9,866	2,954	2,891
Cost of materials, fuel and electricity used	3,370	1,350	1,202	18,937	29,902	21,486	6,361	1,813	1,317
Amount paid for work given out	--	-	—	5	26	27		1	—
Net output	3,413	1,784	1,735	5,583	5,472	5,018	3,505	1,140	1,014
Wages and salaries of persons employed	1,430		–	3,329		--	1,680		—
Average number of persons employed	No. 3,555	No 2,956	No 2,766	No. 9,410	No 13,596	No 12,545	No. 4,755	No 3,767	No 3,473
Net output per person employed	£ 900	£ 603	£ 627	£ 593	£ 402	£ 400	£ 737	£ 303	£ 292
Number of establishments	No. 52	--	No 58	No 43	No	No 62	No 59	No	No. 53
Total value of sales .	£'000 6,888			£'000 24,583			£'000 9,896		
New plant acquired	104			476			331		

GERMAN GLASS & LABORATORY SUPPLIES

(*continued from previous page*)

for up to six standard size sieves (J. Engelsmann, A. G., Ludwigshafen a/Rhine), a very compact apparatus for measuring the "digestibility" of various coatings on pharmaceutical preparations, etc. (Ing. Georg Nold, Griesheim-Darmstadt). By the same firm was a diaphragm dosing pump containing up to three separate sections for different liquids, the stroke on each section being individually controllable from zero to 60 litres per hour; and a precision dosing apparatus containing four all-glass pumps of special design permitting control to an accuracy of 0.04 ml. on a stroke of 12 ml. (max.)

Various sections of the exhibition dealt with containers and packing machines (Hall II), industrial types of gauges, indicators and recorders (Hall IV), grinding, screening, distillation equipment, conveyors, pumps, valves, etc. (Hall VII) and constructional materials, acid-resistant coatings and linings, etc. (Hall VIII).

In the section concerned with valves, pipelines, etc., some very good equipment was exhibited by Amag-Hilpert Pegnitzhütte A.G., Pegnitz-Ofr., in particular the wide range of special pumps for dealing with various mineral acids and corrosive liquors. Paul Bungartz & Co., Düsseldorf-Obercassel, show a very interesting acid resistant pump fitted with a centrifugally controlled valve over the packing. This pump (Type MOR) is said to be the only glandless centrifugal which is also perfectly sealed both when not in operation and during starting up (until reaching 80 per cent maximum r.p.m.).

Ten large organisations specialising in the production of castings of all kinds for the chemical industry have combined under the title of Fachabteilung Chemieguss, Hagen i.W. Similar combinations of other groups of producers of chemical engineering equipment are expected to be formed in the near future.

There were interesting exhibits in the field of centrifuges, rotary filters, etc., by non-German firms such as Dorr, Escher Wyss and the Buss A.G., of Basle (showing a continuous worm mixer with a reciprocating movement of the worm-shaft). Carl Padberg, Lahr/Schwartzwald, showed a laboratory centrifuge (CEPA No. 1) which appeared to be remarkably similar to the familiar Sharples model.

Technical Publications

IN addition to increasing productivity and improving quality by allowing one skilled man to set the timing of processes for less skilled operators, timers, relays and pressure switches can be linked to give individual time-control of each stage of a process, regulate the sequence and permit automatic repetition. These are some of the considerations now called to mind by Londex, Ltd., which has issued a series of leaflets describing its instruments and their varied applications in the chemical industry.

* * *

VALUABLE work is being done by the Scientific Film Association, whose wide range of activities are reflected in its quarterly "Bulletin", the June issue of which is now available. Among the wide range of films considered by the appraisal committee were a large number on chemistry. The association has organised conferences and exhibitions of scientific films and will send a delegation to the fourth congress of the International Scientific Film Association in Italy in October. The Scientific Film Association appeals for more members to support its work which is largely voluntary, and also requires more specialists for the panels which appraise the new specialist films.

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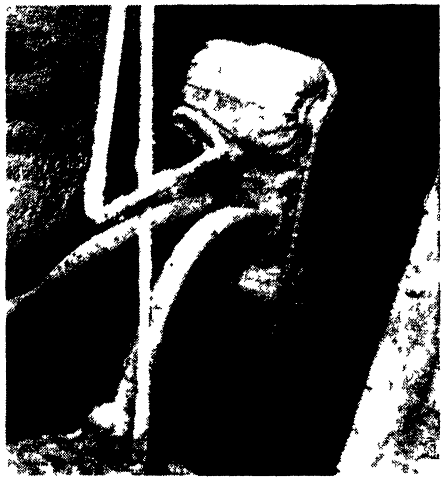
A NEW step in the many varied industrial applications of aluminium and its alloys is marked by the production by the aluminium industry of additional extruded sections that will be of assistance to road vehicle designers and builders. A total of 82 sections is described in the latest addition (AB/5) to the series of application brochures available from the Aluminium Development Asssociation.

* * *

THE wide range of interests covered by the Powell Duffryn group is reflected in the variety of subjects featured in the July issue (No. 84) of the "Powell Duffryn Review." The entry of Powell Duffryn Carbon Products, Ltd., into the field of chemical carbons is noted by a description of the three principal products: chemical tiles for vat linings, the cubic heat exchanger and Paragrid tower packings, which were exhibited at the BIF, Birmingham.

* * *

CRITICISM that insufficient use is made of transparent film and sheet in the packaging of British goods is contained in the report on "Consumer Goods for the Canadian Market" made by the British Export Trade Research Organisation to the President of the Board of Trade, and now published by HMSO.



[By courtesy of Girdlestone Pumps, Ltd

An exceptional example of a pumping operation being carried out under arduous conditions is represented in this picture of a Girdlestone glandless diaphragm pump circulating vitreous enamel. Designed to circulated corrosive and abrasive materials, the pump will operate with a wide range of liquids, from hydrochloric acid to solutions containing diamond dust and ground glass. The liquid is completely sealed and all potential leak points (stuffing boxes, rotary seals, etc.) have been eliminated

THE British Standards Institution has just issued the first revision of a British Standard relating to cod oil for sulphonation purposes (B.S. 868:1950). It was originally published in 1939 and, although some of the characteristics have been slightly amended, the principal reason for the revision was that the methods of test have been brought into line with current practice. The standard provides limits for various characteristics as well as full description of the test methods.

Copies of this standard cost 2s. (post paid).

The Chemist's Bookshelf

THE CHEMICAL ELEMENTS AND THEIR COMPOUNDS. N. V. Sidgwick. 1950. London: Oxford University Press (Geoffrey Cumberlege). 2 Vols. Pp. xxxii + 853; vi + 850. 70s.

Professor Sidgwick's book has long been awaited by inorganic chemists, and its appearance may be said to provide a landmark in the development of textbooks in inorganic chemistry. A large amount of material has been gathered together here which cannot otherwise be readily obtained. Professor Sidgwick is, however, fully aware that it is not sufficient merely to collect facts without any serious attempt to put these in order. Indeed, one of the flaws in the teaching of inorganic chemistry in the past has been the failure to realise the most fundamental task of the chemist is not merely to collect facts, but to determine the theoretical relationships between them. Too many textbooks have alienated students from the inorganic field simply because they have given the impression that the study of inorganic chemistry demands the capacity to swallow masses of unco-ordinated and often apparently irreconcilable snippets of information.

The theory of the structure of matter has, however, been sufficiently advanced long enough to permit this illusion to be dispelled. Students should realise that it is possible to learn a great deal of inorganic chemistry with hardly a reference to specific compounds: while there are a number of excellent textbooks of a more specialised nature containing monographs on selected inorganic topics, which show clearly a profitable and a palatable approach to modern inorganic chemistry. Modern developments have done something to destroy the belief that inorganic chemistry is a finished chapter, and Professor Sidgwick's treatment of inorganic chemistry as a whole, rather than as a series of isolated topics, should help in furthering this view and in inducing the newer generation of chemists to regard the inorganic field as one worthy of research.

The claim for the book as a rational inorganic chemistry is quite justified. The chief regret is that the pattern on which discussion has been based is the short form of the Periodic Table rather than one of the long forms of the periodic classification of the elements. Adoption of one of the latter would have avoided the necessity of first classing together sub-groups of elements, and then demolishing the artificial links between these sub-groups which the short Periodic Table has constructed. The long forms, based on atomic structure, always impress the student as being more logical, particularly since here, in contrast, it is often possible to show that anomalous behaviour has a theoretical basis.

On the other hand, it is refreshing to find carbon treated in its inorganic context as, admittedly, the parent element of organic chemistry, but nevertheless amenable, in its compounds, to the same kind of theory as the remainder of the elements. Too often the distinction between carbon and other elements is emphasised by referring the reader to an organic textbook for even the most elementary treatment. Unification, by discussing carbon on its merits side by side with that of related elements, should be the aim of the teacher, bcause it is the proper fundamental approach, and also because contrast is as valuable as comparison.

The reader of these two volumes must be fully aware, as Professor Sidgwick readily admits in his introduction, that inorganic chemistry is advancing so rapidly that parts of the work had become incorrect or incomplete even at publication. No one, however, can fail to be impressed by the breadth of scholarship and the detailed labour that have gone to the making of the book. The author index alone occupies over 40 pages. It is not to be doubted that, as in the case of Professor Sidgwick's earlier books, this monumental work will prove an inspiration to the present generation of chemists, both inorganic and otherwise.

By comparison with contemporary scientific textbooks of comparable size and significance, the price is very reasonable. The publishers are to be congratulated for adjusting the cost of the book so as to place this wealth of information within the reach of any serious worker.—C.W.

OVERSEAS

Venezuelan Sugar

The Government of Venezuela proposes to spend 100 million bolivares on the development of sugar production during the next three years, in an effort to make the country self-supporting in this commodity.

New Canadian Aluminium Plant

A new pot line opened at Shawinigan Falls, Quebec, by the Aluminium Company of Canada to meet the continuing world demand for aluminium ingot, is expected to produce 15,000 tons of metal a year.

Industrial Explosives in French Guinea

The Sté. Générale d'Explosives is building a factory for the manufacture of industrial explosives at Kinakry in French Guinea, which it is hoped will help the mining industry as well as civil engineering.

New Australian Crystal Sulphate Plant

A new crystal sulphate plant installed by the Australian Iron & Steel Company at Port Kembla, New South Wales, is believed to be the first of its kind in the southern hemisphere. Ammonium sulphate fertiliser is being obtained as a by-product of coke oven operation. The crystal sulphate product is used by the Queensland sugar industry and for the manufacture of mixed fertilisers.

Lead Developments in Portugal

Portugal's production of lead concentrates is reported to have amounted to 1100 metric tons last year (1000 metric tons in 1948). Out of this total, the Mina de Ceife, near Penemacor, accounted for 800 metric tons with a lead-content of 60-65 per cent, and the Mina de Bracal, near Oporto, for 300 metric tons with a lead-content of 55-60 per cent. A project to double the capacity of the Mina de Ceife is being considered.

PVC Works for Japan

The Nissin Chemical Co. (formerly the Sumitomo Chemical Co.) is reported to be erecting a PVC works with an initial monthly capacity of 30 metric tons. It is hoped to increase the output within about two years, to 300 metric tons per month. The initial production will be used by the Sumitomo Electrical Industries Co. in the manufacture of electric cables. Except the polymerisation plant, all the machinery of the new works has been taken from the former rubber works of the Sumitomo Company in Niihama, Shikoku.

New U.S. Insulator

A high degree of resistance to flame and electrical properties approaching those of polythene is claimed for a new plastics electrical insulation material, Rulan, produced by the E. I. Du Pont de Nemours Company. It lends itself to high speed extruding on wire.

New German Oil Refinery

Work has recently started on the construction of a new German oil refinery near Holzhausen north of Lingen in the Emsland. The new plant, which is to start refining operations in 1952, will be one of the largest of its kind in Germany and will treat some 600,000 metric tons of crude annually. A pipe-line is to connect local oilfields with the plant.

French Uranium Mine Opened

A new uranium mine at La Crouzille, near Limoges, France, was put into service last week in the presence of M. Dautry, general administrator of the Atomic Energy Commission. The characteristic of the ore extracted at La Crouzille is that the pitchblende can be separated on the spot, whereas in other mines radioactive rock has to be crushed and washed beforehand.

Motor Spirit from Molasses

Proposals to utilise surplus molasses for the manufacture of anhydrous alcohol for use as motor spirit have been put forward by the Jamaica Sugar Manufacturers' Association for approval of the Government. It is estimated that in 1951 one million gallons of anhydrous alcohol could be produced. When mixed with petrol, it is claimed, this would keep in the island £50,000 spent on imported fuel.

New Hydrogen Peroxide Source

What was described as a feasible alternative method of producing hydrogen peroxide was outlined recently by chemists of the University of Washington (G. L. Putnam and J. F. Sullivan) to the American Chemical Society. It is designed to use the large volumes of hydrogen, by-product of the electrochemical industry, and oxygen from the air approximately in the proportions of 20 to 1. The basic principle is heat treatment of the gas mixture and passing through it a high-voltage alternating current (maximum 15,000 volts). About 15 kWh are required to produce 1 lb. of hydrogen peroxide. Reduction of energy may be possible if special glass equipment is employed.

PERSONAL

MR. S. A. BARKER, B.Sc., Ph.D., of Birmingham University, has been appointed Mackinnon Research Student of the Royal Society for two years from October 1, 1950. He will work on the enzymic synthesis of polysaccharides.

MR. ARTHUR MASON, F.T.I., retired textile consultant, living at Marlow, Bucks., has been elected an honorary life member of the Textile Institute. He served as a member of the Institute's Council in 1944-45, and of the London Section Committee from 1939-45.

A research studentship, awarded by the Textile Institute in 1948 to MR. F. R. ALSBERG, A.T.I., of Prestwich, near Manchester, and renewed in 1949, has been renewed for a further year to enable him to continue research work at Manchester College of Technology. Mr. Alsberg a laboratory assistant at I.C.I., Ltd., is making a quantitative examination of the effect of agitation on the rate of dyeing in the cellulose-direct dye system.

Among new fellows recently elected by the council of the Institution of Works Managers were the following:—MR. J. AYRES, director of the Brush Electrical Engineering Co., Ltd.; MR. H. L. SATCHELL, director, and MR. H. DREGHORN and MR. H. F. FARMER, superintendents, all of the company's Rugby works; MR. E. C. FRYER, general manager and direc'or of Josiah Parkes & Co., Ltd.; MR. E. D. GALLOWAY, secretary of the Glasgow branch of Henry Wiggin & Co., Ltd.; MR. F. JENKS, manager of the oil production division of J. Bibby & Sons, Ltd., and MR. L. J. WALKER, works manager to Potter & Clarke, Ltd.

Fellows and Associates

THE Institute of Physics has elected seven new Fellows and 25 Associates in this country and overseas. They are these:—

Fellows. W. J. R. Calvert, K. R. Makinson (Australia), T. C. Marwick, J. B. Rudd, M. K. Sen (India), L. A. A. Thomas and H. W. Thompson.

Associates. W. H. Alexander, G. W. Bloomfield, L. Brown, J. Critchlow, A. W. Cronshaw, D. E. Davies, G. W. Eastwood, F. H. Hibberd (Australia), R. J. Hodgkinson, D. Jolly (Australia), C. E. Jones, R. Joseph, A. J. Kent, A. G.

(continued at foot of next column)

Loudon, K. W. Lyon, C. R. Major, J. M. Messenger (Kenya), A. C. Moore, D. A. Perrott, P. W. Roberts, W. A. D. Randall, A. G. Thompson, E. J. W. Whittaker, D. J. Williams and J. G. Walford.

In addition 22 graduates, three subscribers and 18 students were elected.

PHYSICS AND INDUSTRY

THE growth of the activities and importance of the Institute of Physics, associated with the increasing impact of physics in current industrial operations, is reflected in the summary of the institute's work during 1949.

The trend was made evident at the annual meeting of the organisation in London on July 20, at which Prof. W. E. Curtis, professor of physics at King's College, University of Durham, was elected president.

Prof. E. G. Cox was elected a vice-president, and Dr. F. P. Bowden and Mr. G. R. Noakes were elected ordinary members of the board. The hon. treasurer, Mr. E. R. Davies, and the hon. sec. Dr. B. P. Dudding were re-elected. Prof. H. W. Thompson joined the board as the new representative of the Faraday Society.

New Sections

The report for 1949 records the inauguration during the year of the Education Group and the North Eastern branch, making the seventh specialist subject group and the eighth branch. These 15 groups and branches held many meetings and visited various laboratories; the five divisions of the Australian branch held 39 meetings during the year.

An outstanding event was the first convention of its kind to be organised by the institute. This was held in Buxton and was attended by over 400 people.

Nine colleges in England and Wales have had their courses approved for national certificates in applied physics and arrangements were made with the Scottish Education Department for the establishment of similar courses in Scotland.

The institute collaborated with the Universities of Bristol and Cambridge and University College, London, in summer schools on special branches of physics.

The report records the establishment in April this year of the *British Journal of Applied Physics* and a monthly *Bulletin*.

The institute's officers have dealt with many inquiries about salaries, conditions of service, consulting fees, professional training and similar matters.

• HOME •

New Chemists and Druggists

One hundred and seventy-one men, and 72 women were successful in the July examinations of the Pharmaceutical Society.

Less Coal Raised

Mining output in the week ended July 22, diminished by holidays, was for the second week below the level of 4 million tons (deep mined). The yields were 3,881,600 tons and 257,400 tons from open-cast operations.

Freer Imports from Belgium

In accordance with the liberalisation of trade policy, Board of Trade open general licences have been extended to embrace Belgium, Luxemburg and the Belgian Congo from July 17. A large range of goods from these countries is now freed from import licensing restrictions.

I.C.I. Celebrations

Presentation of long service awards to 100 members of the Gaskell-Marsh works were made at the I.C.I. recreation club, Widnes, last week, by Mr. G. K. Hampshire, chairman of the General Chemicals Division. At the same time the chemical workers and staffs presented the board of directors with a memento of the Widnes centenary celebrations.

Textile Technology

A record number of 180 candidates sat for the annual examination of the Textile Institute in general textile technology. The pass list, issued last week, showed that 71 were successful, while some overseas results had yet to be announced. Last year there were 144 entrants of whom 64 passed. The only woman candidate this year was Miss J. M. Reading, aged 23, who was sucessful. She studied at Leicester College of Technology and is a laboratory assistant with a Leicester firm.

London HQ for Standard Oil

The Anglo-American Oil Co., Ltd., has announced that the Esso Export Corporation, international sales affiliate of Standard Oil Company (New Jersey), is to establish a European administrative office. The headquarters will be in London and the purpose to co-ordinate the refinery production of all Jersey Standard's affiliates in Western Europe and to adjust the balance of market requirements. Mr. George M. Parker, lately adviser to the Jersey organisation in foreign marketing operations, has been elected vice president and will be in charge of the European office.

"The Growth of Solvents Production"

A commentary on the expansion since the war of products of British Industrial Solvents, Ltd. (THE CHEMICAL AGE, 63, 117) indicated that one of these was "di-ethyl hexyl alcohol." The new alcohol form is in fact 2-ethyl hexyl alcohol.

U.K. Light Metal Statistics

Ministry of Supply statistics relating to U.K. production, imports and consumption of light metals in May include the following (in long tons): Virgin aluminium: production 2590, imports 21,836. Secondary aluminium: production 7204. Aluminium scrap arisings 8382; consumption 9769. Aluminium fabrication 18,384; foil 1003. Magnesium fabrication 287.

Leeds Gifts for Research

The Yorkshire Dyeware & Chemical Co., Ltd., has given £200 a year for the seven years, starting 1951-52, towards the payment of a research assistant in the Colour Chemistry and Dyeing Department of Leeds University. A gift of £400 has also been received from the Association of the Leather Trades of Leeds and District for the Leather Industries Department of the University.

Miners' Wage Claim

The National Union of Mineworkers, at an informal meeting with the National Coal Board in London on July 20, presented its claim for an increase in wages. The board and the union expressed their regret that their meeting should have taken place at a time when some pits in Scotland were still affected by an unofficial strike. It was decided that if the men on strike had returned on Tuesday this week, a meeting of the joint national negotiating committee for the coal mining industry would take place on that day.

Colliery Exploits Natural Gas

A scheme to fire all four boilers of Point of Ayr Colliery, Flintshire, with natural gas is nearing completion. It is stated that already 6500 tons of coal are being saved and several men have been released for the direct production of coal. Efforts were made to remove some of the gas in advance of the coal workings before 1940, either by compressing it into cylinders for driving vehicles or by burning it in the colliery boilers. Shortage of equipment held up the work, which was taken up again in 1947. On April 28 sufficient gas was coming up to fire one boiler, followed by a second on May 4.

Company News

The Distillers Co., Ltd.

The consolidated profits of the Distillers Company and its subsidiaries in the year ended March 31 totalled £12,887,691, which compares with £10,361,857 in 1948-49. After sundry credits and charges, including £953,078 to cover depreciation (£507,095 in the previous year) there remains £6,879,300 (£5,130,597). The recommended final dividend on the ordinary stock is 7.2d. per 4s. unit, making a total return equivalent to 20 per cent for the year. Employees are to receive an "export incentive bonus" of 2½ per cent of their wages or salaries.

Increases of Capital

The following increases in registered capital have been announced: Anchor Chemical Co., Ltd., from £150,000 to £225,000; Lodge-Cottrell, Ltd., from £100,000 to £300,000; Unifloc, Ltd., from £16,000 to £80,000.

New Registrations

Chemical Developments (Luton), Ltd.

Private company. (484,483). Capital £500. Chemical manufacturers and distributors, dye makers, dyers, bleachers, makers of acids, limes, alkalis and chemicals of all kinds. Solicitors: Giffen, Couch & Archer, Luton.

Nucleonic and Radiological Developments, Ltd.

Private company. (484,581). Capital £10,000. To develop and manufacture equipment and apparatus for electrical, radiological, nuclear and physical engineering. Reg. office: Baltic House, Leadenhall Street, E.C.

Japanese Production Plans

THE Japanese Ministry of International Trade and Industry indicates that a production plan for synthetic organic chemicals in the year ending March 31, 1951, calls for the following: (in metric tons) acetaldehyde, 17,100; acetic acid, 16,050; acetic anhydride, 2340; butanol, 2620; butyl acetate, 1800; cellulose acetate, 810; ethyl acetate, 3650; ethylene glycol, 500; formaldehyde (40 per cent), 7500; formic acid (80 per cent), 240; methanol, 20,000; oxalic acid, 960; trichloroethylene, 400; vinyl acetate, 6400; and vinyl chloride 2100.

ENGINEERING PAPERS.

A USEFUL programme of meetings was held by the Chemical Engineering Group of the Society of Chemical Industry in 1948 and the activities have now been summarised in Volume 30 of *Proceedings*, with illustrations and diagrams (price 21s.). A number of papers presented during the year have been permanently recorded in this volume. They are as follows: "Abrasion, Erosion and Corrosion," C. H. Desch; "What Can We Learn from the Mechanical Engineer in Process Design?" E. J. Stephens; "Recent Developments in Brewery Plant and Equipment in Scandinavia and U.S.A.," J. L. McCowen; "A New Cast Iron: the Nodular Graphite Structure," J. G. Pearce; "Modern Propellants Used in British Ordnance," J. N. Pring; "The Refining and Hardening of Vegetable Oils," A. Arneil; "The Production of 96 per cent Sulphuric Acid on a Chamber Plant," S. B. Cormack; "Recent Developments in High Vacuum Technology," R. S. Morse; "Heat Transfer," A. D. Davidson; "Physiological Effects of the Products of Nuclear Fission," Katharine Williams; "Radiation Hazards and their Control," E. F. Edson.

Synthetic Fuels and Chemicals

IN view of the current shortages of benzene and phenol, the United States Bureau of Mines is undertaking a new investigation of the likely yield of these and other chemicals as a result of producing synthetic liquid fuels from coal and oil shale.

Benzene becomes continually more important as a basic raw material. Such products as synthetic rubber, plastics, nylon and detergents readily account for the sharp increase in demand during the past ten years. Until recently, benzene was available only as a co-product in the manufacture of oven coke. Now, for the first time, benzene is being produced from petroleum at Texas City, Texas, where a plant has been established with an annual capacity of 5 million gal.

Shale oil also contains significant amounts of aromatic chemicals, "tar acids"—phenol, cresols, and xylenols—and "tar bases"—homologues of pyridine and quinoline. Preliminary determinations of the volume of aromatics in crude shale oil indicate a larger percentage of "tar bases" than in tars from coal carbonisation.

Chemical and Allied Stocks and Shares

LATEST Korean war news and expectations that rearmament means increased taxation have kept markets subdued. Most sections were easier under the lead of British Funds. There was little selling, and buyers showed great caution awaiting developments. Armament and kindred shares were the only section to show gains.

Chemicals kept steady with Imperials little changed at 40s. 6d., but Monsanto eased to 48s. 6d., although British Glues and Chemicals 4s. ordinary were firm at 28s. 3d., on the big profit increase shown for the past year, the unchanged 25 per cent dividend and the share bonus of two new shares for every seven held.

Laporte Chemicals 5s. shares were 10s. 3d., while Albright & Wilsons 5s. shares kept at 29s. 3d., the market expecting the latter company to announce its new issue plans soon. Amber Chemical 2s. shares were 3s., F. W. Berk 10s. 3d., Boake Roberts 5s. shares 26s. 6d., while Brotherton 10s. shares were firm at 20s. and W. J. Bush 72s. Bowman Chemical 4s. shares were 5s. 3d. and Pest Control 5s. shares 7s. 4½. Sanitas Trust 10s. shares were 15s. 6d. L. B. Holliday 4½ per cent preference were 19s. 6d. and Woolley 4¾ per cent debentures 104½.

The 4s. units of the Distillers Co. were active around 18s. 7½d., on the big increase in group trading profits. Taxation limits earnings, but the decision to pay 20 per cent dividend on the larger capital is regarded as indicating confidence, and the market expects that this rate will be maintained in future. It represents an increased cash distribution for shareholders because it compares with 27½ per cent for the previous year which would have been equivalent to 18⅓ per cent on the capital now ranking. This has, of course, been increased by the 50 per cent share bonus.

Borax Consolidated have been steady at 54s. 6d., so have British Aluminium at 39s. 6d., but Turner & Newall eased slightly to 81s. 3d., United Molasses to 42s. and Dunlop Rubber to 60s. 1½d. Lever & Unilever were steady at 39s., prior to the annual meeting. Iron and steels were generally higher, having attracted attention together with other companies which can be expected to benefit from rearmament. Colvilles were 35s. 3d., United Steel 27s. 3d., Stewarts & Lloyds 55s. 9d., John Summers 29s. 7d., Guest Keen 45s. 9d., while elsewhere, Babcock & Wilcox were up to 63s. 3d., and T. W. Ward 68s.

Shares of plastic companies were generally steady but De La Rue eased to 22s. 9d., following the results, although the maintained dividend was good. British Industrial Plastics 2s. shares were 5s. 7½d., and British Xylonite 72s. 6d. Boots Drug were better at 47s., with British Drug Houses 5s. shares 7s. Triplex Glass kept steady at 21s. 9d. with United Glass Bottle firm at 75s. After rallying towards the end of last week, oils came back with the general trend. Shell were back to 62s. 6d. and Anglo-Iranian to £5 13/16 while Burmah Oil reacted sharply to 55s. 7½d.

Indian Castor Oil Specification

A UNIFORMLY good quality for castor oil is a matter of considerable importance to India, which produces some 38,000 tons annually, of which nearly 17,000 tons are exported. The lubricants sectional committee of the Indian Standards Institution has therefore developed a draft Indian standard specification for this oil.

The standard covers the requirements for four grades of castor oil in respect of clarity, colour, specific gravity, refractive index, saponification value, iodine value, acetyl value, acid value, unsaponifiable matter, critical solution temperature and ash content of the oil. Methods of sampling and testing of castor oil have also been included in the specification in two appendices.

This draft has been circulated to members of the institution and to large consumers, manufacturers and technologists concerned. Comments will be received by the director, Indian Standards Institution, Delhi, up to August 5, 1950.

More Petroleum for Germany

The economic authorities in the Federal German Republic are planning to terminate control and rationing of liquid fuels as from January 1, 1951. It is hoped to free Diesel oil this autumn. The proposals presuppose the availability of adequate domestic reserves, equivalent to at least the average quarterly consumption. The additional cost of supplying the German liquid fuel market after the termination of control is estimated at about Dm. 180 million annually. Crude oil output in Western Germany in May amounted to 93,778 metric tons, compared with 89,550 tons in April.

Prices of British Chemical Products

Rising Cost of Metal Derivatives

REASONABLY active trading conditions prevail generally on the industrial chemicals market. The volume of inquiry both for home and for shipment continues to be satisfactory, although uncertainty in the international situation is not without its effect on new contract business. While there has been little change in the overall price position, the undertone is strong in nearly all sections of the market. Trading conditions in the coal tar products market have been well maintained, with creosote oil and the light distillates again in good request.

MANCHESTER.—Values on the Manchester market for heavy chemical products during the past week have remained steady to firm in all sections, with further advances recorded in the lead compounds as a result of the fresh rise in the metal. On home trade account there has been a fairly regular movement of supplies of most of the leading chemicals against contract commitments. Replacement buying has occurred as the need arose, while a fair trade passed for shipment, mainly to the Empire markets. Some activity is reported in the fertiliser market, with a moderate volume of business being transacted in both the light and heavy tar products.

GLASGOW.—Business in general has been fairly good over the past week in the Scottish chemical market, although the Glasgow Fair holidays have somewhat diminished the bulk quantities required. The export market continues to be reasonably active.

Price Changes

Rises: Copper carbonate, copper sulphate, red lead, white lead, litharge, phosphoric acid, salicylic acid, sodium nitrate (Chilean), carbon tetrachloride, carbolic acid crystals (Manchester).

Reductions: Butyl acetate BSS, butyl alcohol BSS, magnesium chloride.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton,. £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4¾d. per lb. Crimson, 2s. 6½d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£144 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£135 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 9d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£52 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £114 10s.; orange lead, £126 10s. Ground in oil: red, £137 5s.; orange, £149 5s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £124 per ton. Ground in oil, English, under 2 tons, £143 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£114 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £63 10s. per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals. nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 5s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £121 10s.; green seal, £120 10s.; red seal, £119.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, " Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £10 12s. (July, £12 6s. 6d.)

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 17s. I.C.I. Special No. 1, £16 11s. (July, £19 4s.). National No. 2, £11 0s. 6d. per ton.

" Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5½d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: July 26. The prices of all refined oil and fats remain unchanged during the eight-week period ending on August 12. Prices of all unrefined oils and fats remain unchanged during the four-week period ending August 5.

CLASSIFIED ADVERTISEMENTS

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Three double trough type **JACKETED MIXERS** by **WERNER PFLEIDERER,** trough 24½ in. by 24½ in. by 19½ in. deep, fitted double fin type agitators. Driven at variable speeds through single machine cut gearing from clutch op. driving and reversing pulleys. Hand op. tilting. Agitators can be used whilst tilting. 10/15 h.p. required to drive.

Eight double trough type **JACKETED MIXERS** by **WERNER PFLEIDERER.** Int. dimens., 2 ft. 4½ in. by 2 ft. 5 in. by 2 ft. 3½ in. deep. Fitted twin double fin type agitators, driven through gearing by pulleys. Hand op. tilting. 10/15 h.p. required to drive.

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The Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Neglected Lime Producers

THE use of lime in husbandry is said to be older than Christianity. Much of our farming lore is associated with crisp generalisations about the white and the black manures—lime and animal dung. But the very antiquity and familiarity of lime has probably deprived it of some of its significance in an age which seems slightly bemused by the great new fields which synthesis techniques have uncovered. The abundance of limestone deposits in this country and the relative cheapness of lime—whether as burnt lime, hydrated lime, or ground limestone itself—has made it something of a Cinderella to farmers and chemists alike. The proof of that can be seen in the fact that our soils generally were so acidic that in 1937, under the Land Fertility Scheme, began the generous subsidy payment to encourage farmers to apply lime. These subsidies to-day amount to about half the cost of lime and its spreading and, while feeding stuffs and fertilisers are being bereft of subsidies, there is no sign of a change in policy towards the older subsidies for lime. Yet it is clear from a recent survey that the tonnage of lime applied to our soils is still alarmingly below minimum technical requirements.

In 1941 it was estimated that our arable and grassland acreage, excluding rough grazing land, required 15½ million tons of lime (as calcium oxide). This was not an annual requirement but an overall quantity needed to bring these soils to a *p*H favourable to efficient food production. Had it been possible to apply all this lime in one or two years there would still have been need for an annual maintenance tonnage to balance the steady losses of lime which result inevitably from leaching and crop uptake. Between 1937 and 1949, under the Land Fertility Scheme, some 16 million tons of lime have been applied. A new estimate has been made to see how much this twelve-year effort has reduced the overall or intrinsic requirement. According to a report in the current *National Agricultural Advisory Service's Quarterly Review* (1950, *8*, 183-184) the overall requirement still stands at 14 million tons of lime. In short, most of the 16 million tons applied from 1937-1949 have only balanced losses; possibly some 1½ million tons has in addition reduced the initial degree of acidity in the soils of England and Wales. The problem is still huge and of a much greater significance, now that we have a far more intensified agriculture than we had in the 'thirties.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

It is no exaggeration that chemical industry as a whole has been content to neglect lime and lime-containing materials except insofar as they are required for chemical processes. Lime is generally looked upon less as a valuable chemical substance than as a material worthy of attention only when it can be cheaply handled mechanically. Its low cost and its familiar abundance have placed lime low in the chemical list. If to-day farmers were to take a full advantage of the subsidies and start buying on a really substantial scale it is doubtful if the tonnage of agricultural lime required could be produced.

The ancient process of burning limestone in kilns to produce lime itself has been handicapped by fuel shortage and rising fuel costs, and it is now well established that this operation is not warranted for the production of agricultural material. Ground limestone is at least as efficient as burnt lime, although roughly twice the amount per acre must be applied; for equivalent alkalinity, limestone reduces soil acidity quite as effectively as burnt lime. Many farmers, unfortunately, have yet to accept this modern concept of liming and the full utilisation of limestone deposits is held back by the "burnt lime" doctrine of both producers and consumers. Meanwhile, in terms of ground limstone, the overall requirement of our soils is 28 million tons, i.e., twice the estimated lime requirement, and the annual maintenance amount is probably 3 to 3½ million tons. Here, surely, is an opportunity for the most fruitful collaboration between the Ministry of Agriculture, chemical industry and farmers. The raw material does not have to be imported; most workable deposits are in country areas, or certainly outside the congested industrial centres, so that an expanded production of ground limestone should not have to face serious labour shortages.

The present comparative neglect of lime and limestone can be traced in a large measure to the fact that, from their inception, the subsidies have aimed solely at encouraging the farmer to use more lime; there has been no direct incentive to potential producers to make available more lime or limestone. There is evidence that some limestone quarries find the agricultural trade less profitable than the building trade. The fact that every farm bill for lime must be scrutinised by the Ministry responsible for paying the farmer the 50 per cent subsidy has led to an indirect and implied system of low and controlled prices per ton. A subsidy which was intended to

(*continued on page* 182)

Notes and Comments

Mercurial Lead Prices

THE laconic announcements by the Ministry of Supply that lead has undergone another price increase of so many pounds per ton have, by repetition, acquired such familiarity that to many they must seem "just another administrative adjustment." The considerably more serious import of lead charges five or six times as large as the pre-war figure (£123 last year and £96 per ton now) to those who must have the metal or its oxides to maintain export business has been pointedly presented by Mr. H. S. Tasker, chairman of Goodlass Wall & Lead Industries. The mercurial character of lead prices since the beginning of last year has posed for lead users problems more appropriate to professional backers of racehorses. Most of the responsibility for that rests upon the widely fluctuating American market by which English prices are broadly regulated. That is perhaps unavoidable under bulk buying. What is avoidable—and inexcusable in the light of the Government's enthusiasm for competitive pricing in the export markets—is the tendency of the Ministry of Supply to act as an astute monopolist maintaining lead prices above the figure ruling in other markets. This means of augmenting the vast sums of which the Government now disposes is even more objectionable than the company profits tax.

Themes for Section B

THE panel which selected from the multiplicity of "possibles" the chemistry subjects to be presented before the famous Section B of the British Association meeting in Birmingham at the end of this month must be endowed with uncommon self restraint to have resisted so well the temptation to admit a dozen fascinating themes. The selectors for the chemistry section have confined the scope broadly to four themes—carbohydrates, which Professor E. L. Hirst, F.R.S., will introduce in his presidential address; contemporary ideas regarding the natural and synthetic polymers; the eminently topical subject of chromatography; and finally the widely differing manifestations of chemical energy and practical or potential methods of harnessing it. Even without the supplement of visits to some most advanced chemical works in the Birmingham area and the topical interest of some companion sections, such as the industrial possibilities of nuclear power and radioactive isotopes (Section A, Mathematics and Physics), Birmingham would be invested with exceptional attractiveness for Chemists from August 31 until September 6.

Chemical Scope of Canada

CANADIAN chemical industries sometimes seem to exemplify collectively chemical development in its most promising form, armed with the most advanced technology and a growing storehouse of material in its crops, minerals and petroleum. Most Canadians would readily accept that proposition and could quote half a dozen good reasons why Canada's rôle as producer of foodstuffs and buyer of chemicals and other highly evolved products of outside industries—normally those of Great Britain and the U.S.A.—has now nearly been played out. The knowledge that in June this year Canada bought from this country chemicals of various kinds worth £263,000, twice as much as in any June in the previous two years, probably does not invalidate the confidence that has grown out of the initial development of the great petroleum reserves located in Alberta and the relatively rapid creation of new production capacity as advanced as anything to be found below the U.S. border. All those factors have been taken into account in the latest survey of Canada's chemical future, an admirably well balanced review by Mr. Arnold H. Smith (the Monsanto

Chemical Co. (Canada), Ltd.) to the Canadian Society of Chemical Industry, of which he is president. "Of all the present industrial countries Canada seems to be in the number two position for overall raw material supplies needed by the chemical industries," is one of his conclusions. Resulting from the new awareness of the wealth contained in her abundant coal, oil, gas, timber and water power, production of actual chemicals alone rose 11 per cent, to $150 million between 1948 and 1949. Growing support is likely to be found for the proposition that Canada should now protect these precious growths, having in mind the formidable U.S. tariff wall and our own Key Industry Duties.

A Refractory Subject

THE presentation by radio of chemistry and similar scientific themes in their relationship to everyday life seems to have established a successful tradition here. An indication of the possible extent of developments of the principle of talking to ordinary individuals about industrial and scientific affairs which they might be expected to regard with complete indifference can be seen in recent experiments in the U.S.A., where public enlightenment in esoteric affairs is an older established practice. An extreme example recently in the department of industry was a Pittsburgh broadcast, of which the local group of the American Chemical Society was the sponsor, telling America how great a debt it owed to refractory materials in the provision of the sort of things which modern society cannot dispense with. "Refractories and You" was in the form of an interview with Mr. S. M. Phelps, senior fellow of the refractories fellowship at the Mellon Institute, Pittsburgh, who gave an effective picture of the dependence of a host of common things, tableware, glass, cement, sanitary fittings and so on, upon materials which will resist great heat in the furnace stage of manufacture. As a result, many in the orbit of the Pittsburgh broadcast must now have a fairly clear conception of the sort of work which chemists have to do to make available large tonnages of materials which will resist 1500° C., abrasion by flue dust and furnace charge and the corrosion of slag and incandescent gases. Whether or not that knowledge promotes heightened respect for the chemist, it cannot fail to impart a more balanced view of his part in the general scheme.

An ICI Works to Close

THE I.C.I. tube mill at Witton, Birmingham, is to discontinue operations at the end of this year and the work will be split between the company's new £3 million plant now in course of construction at Kirkby, Liverpool, and other I.C.I. Midlands plants. News of the change, due to reorganisation, had given rise to unfounded rumours that other of the group's tube-making establishments in the Midlands were to close and their operations transferred to Liverpool. A statement was issued from Witton, by Mr. H. E. Jackson, chairman of the I.C.I. Metals Division, discounting this.

Mr. Jackson said the reason for the building of the Liverpool factory, and its equipment with the latest machinery, was because they could not expand the premises in Manchester, where they were subject to flooding. It was hoped to find work in other of the firm's Birmingham factories for the men affected by the change.

NEGLECTED LIME PRODUCERS

(continued from page 180)

encourage lime consumption in the national interest of land fertility has in effect discouraged production. There is now obvious need of some means of giving producers confidence that the agricultural lime trade can be reasonably profitable.

It is an unhappy paradox that at a time when so vast a quantity of lime is known to be vitally needed by our soils there are once-vigorous limestone quarries either idle or producing much less than their real capacity. There is plenty of limestone in the country; it requires only to be quarried, pulverised and spread over the soils that so badly need it.

BRITISH CARBON BLACK

Anglo-U.S. Plant Opened at Stanlow

THE importance of carbon black among the country's key raw materials was stressed by Mr. Harold Wilson, President of the Board of Trade, last week when he opened the Cabot Carbon plant at Stanlow, Ellesmere Port, Cheshire.

Despite initial problems of expense (THE CHEMICAL AGE, 59, 811), the plant, planned by Americans and created by English workmanship, has been completed in little over a year. The factory is the first to be constructed under the Marshall aid investment guarantee.

Nearly the whole of Britain's carbon black has previously been imported from the U.S.A., but it is estimated that the new plant will produce 8-10,000 tons a year at a saving of about $1 million annually. All black smoke will be eliminated by a scrubbing process and there will be no lowering of Merseyside's atmospheric standards.

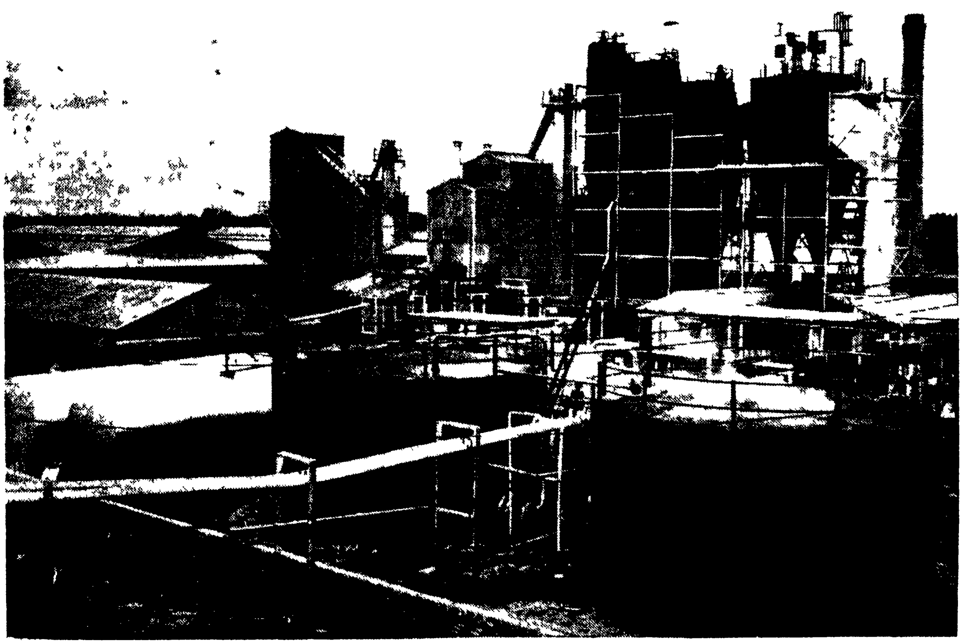
Mr. Louis Cabot, managing director of Cabot Carbon, Ltd., said that the company intended to play its part in Britain's industrial recovery.

SOAPLESS DETERGENTS

Laundry Group Uses No Soap

SYNTHETIC detergents have taken the place of soap in all the laundries of the United Co-operative Laundries Association, Ltd., which has plants at Liverpool, Birkenhead, Manchester, Warrington, etc. This concern has an annual trading turnover of £1 million. Mr. T. Lowe, the general manager, stated at the annual staff conference that the use of soap for the group's laundry processes had been stopped entirely. That decision was based on research and experiment, the results of which had been made available to the industry which he hoped would carry the work still further.

Group manager Mr. J. C. Hogg said soap used to cost UCLA £24,000 per annum. The synthetic materials used instead cost £13,750 for the same volume of work. There was a considerable saving in fuel and in water consumption. Soap, he added, has done a good job in the past and was still doing so for those laundries which can afford it. If synthetic detergents cost the same as soap they would still be the first choice of enlightened laundries.



The new carbon black plant, showing the furnace and fuel storage installations and the large cyclone precipitators

CHEMICAL IMPORTS: £17.3 m.

Record for First Half of the Year

IMPORTS of chemicals, drugs, dyes and colours in June totalled £2,855,164 which was £644,038 more than the same month of 1949, but was £372,817 less than the figure recorded in May—£3,227,981. Decreases occurred in sodium and potassium compounds, and even more markedly in the value of gas and chemical machinery imported. These were offset, however, by marked increases in some items, notably carbon blacks and sulphur.

Total value of imports in chemicals, drugs, dyes and colours for the first six months of this year was £17,353,156 compared with £13,456,734 in the first half of 1949 and £15,519,551 in 1948.

	June, 1950	June, 1949
	Cwt.	Cwt.
Acetic anhydride	7,852	9,845
Acetic acid		5,744
Boric acid	9,640	11,440
Carbolic acid	5,360	—
Value of all other sorts of acid ...	**£90,843**	**£33,910**
	Cwt.	Cwt.
Borax	26,803	18,200
Calcium carbide	—	—
Cobalt oxides	268	—
	Tons	Tons
Fertilisers		123
	Lb.	Lb.
Glycol ethers and gylcol esters ...	483,463	605,220
Iodine		66,050
	Cwt.	Cwt
Potassium chloride	628,021	1,021,250
Potassium sulphate	18,460	12,100
All other potassium compounds ...	17,902	3,166
Value of all potassium compounds	**£556,444**	**£819,766**
	Cwt.	Cwt.
Sodium nitrate	—	81,093
All other sodium compounds ...	11,590	2,283
Value of all sodium compounds ...	**£78,231**	**£85,092**
Dyes and dyestuffs :	Cwt.	Cwt.
Synthetic organic dyestuffs ...	1,110	994
Extracts for dyeing	2,532	994
Extracts for tanning (solid or liquid)	128,219	85,115
All other dyes and dyestuffs ...	513	227
Pigments and extenders :		
Earth colours (except black) ...	19,618	93,927
Carbon blacks from natural gas	72,326	10,410
Value of carbon blacks	**£303,304**	**£30,635**
Value of chemicals, drugs, dyes and colours	**£2,855,164**	**£2,161,626**
	Lb.	Lb.
Essential oils (other than turpentine	468,052	256,340
Value of essential oils	**£349,856**	**£174,413**
Value of oils, fats and resins	**£12,986,002**	**£8,996,011**
	Tons	Tons
Sulphur	48,224	34,423
Value	**£490,488**	**£282,204**
	Cwt.	Cwt.
Gas and chemical machinery ...	116	14,924
Value	**£3,885**	**£203,215**
	Cwt.	Cwt.
Plastic materials	16,910	14,463
Value	**£391,672**	**£355,030**

Service Awards

Gold watches have been presented to 210 Fort Dunlop workers for long service.

BENZENE AND TOLUENE

Advantages of the Catarole Process

A NOTE from Petrochemicals, Ltd., gives useful information about Catarex benzene, one of the many products of the Catarole process, essentially the catalytic thermal decomposition of a light petroelum distillate to give olefines and aromatics. From the aromatic products bulk quantities of Catarex benzene, of a purity not usually encountered in industry, are now being produced at Partington, near Manchester.

The specification for this benzene stipulates a thiophene content of less than 25 p.p.m. and a total sulphur content of less than 0.005 per cent. Very low thiophene and total sulphur contents may be particularly important in catalytic processes (such as the hydrogenation of benzene to cyclohexane), as they ensure relative freedom from catalyst poisoning.

Because of its high purity, the use of Catarex benzene in synthetic reactions, either as reactant or solvent, minimises the formation of undesirable intermediate products. That advantage is already manifest in the production of dyestuffs, pharmaceuticals and other materials.

For processes which require benzenes of even higher purity, two grades, Catarex benzene TF and Catarex reagent benzene are also being manufactured.

Of almost equal importance is the new Catarex toluene now being produced in bulk from the aromatic products at Partington. It has the same low total sulphur content and lacks foreign odour and colour. This toluene contains no di-olefines, and consequently it does not deteriorate in colour when stored.

Toxic Chemicals Panel

A WORKING party to study precautionary measures against the toxic effect of chemicals used in agriculture has been appointed by the Minister of Agriculture and Fisheries. The terms of reference require the panel to advise on the recommendations on this subject made in the report of the Gowers Committee on health, safety, and welfare in non-industrial employment. The working party will be constituted as follows:—

Professor S. Zuckerman (chairman), Mr. A. B. Bartlett, Mr. R. A. E. Galley, Mr. C. T. Gimingham, Mr. A. Holness, Mr W. Morley Davies, Mr. R. G. C. Nisbet, Mr. J. M. Rogan and Mr. H. Cole Tinsley; joint secretaries, Mr. K. R. Allen and Mr. J. T. Martin.

PHARMACEUTICAL INDUSTRY IN WAR

Limited Initiative Displayed in Germany

THE conclusion that German pharmaceutical industry did not advance during the war years at a rate at all comparable with its British counterpart is one of the more interesting conclusions reached in a final survey of the data collected by the various Allied investigation teams when the war ended. "The Pharmaceutical Industry in Germany during the period 1939-45" (BIOS Survey No. 24), which Dr. J. B. M. Coppock, director of the British Baking Industries Research Association, has edited, gives the first overall view of the efficiency and general scope of the industry and provides many specific examples in support of the general views. The falling away from the technical and commercial eminence reached by German groups before the war is a process capable of being rapidly reversed, as Dr. Coppock recognises. Underlining this, the editor says in his preface: "If this review does little more than remind British industry of the need to maintain the advantage and prestige it gained during the war years it will have served its purpose."

Lost Impetus

The report as a whole justifies the general conclusion that German investigation of medicinals, which in several directions was partial and inconclusive, fell on evil days during the supreme control of the Nazis for the waging of war. There was nothing, it would appear, to equal the discovery by the Bayer laboratories of I. G. Farbenindustrie in the 1920's of the antimalarials plasmoquine and atebrin. After the loss of North Africa, the less evident need for really effective quinine substitutes further weakened the effort of the small group in the Bayer laboratories to which the work seems to have been confined. The Germans are considered to have been satisfied with a relatively much lower standard of efficiency of synthetic antimalarial drugs.

Another instance of lack of enterprise on an equivalent scale is represented by what the report records about German policy in regard to antibiotics: "Their knowledge and experience were very limited." The Germans had not secured a satisfactory strain of *Penicillium notatum*. The culture media were of the conventional Czapek-Dox type and the use of corn steep liquor does not appear to have been known. Potencies claimed for the solid product were 50-150 units/mg. No work on streptomcyin had been done.

The backwardness in this instance is considered to have been attributable in part to the belief that antibiotics could not develop into a serious competitor of the sulphonamides.

Incomplete

There is evidence in other sections of the report of much more enterprising policy in relation to bulk production, more especially of such things as analgesics. There are repeated evidences, however, that technical developments to secure the highest quality of product were not always carried to their normal culmination.

The chapters are liberally annotated for reference to the original longer BIOS, FIAT, etc., reports.

The chapters, each contributed by an authority, including the editor, cover broadly these departments of German pharmaceutical industry:—

1 Amino acids and protein hydrolysates,
2 Antibiotics
3 Anticoagulants,
4 Antimalarials,
5 Antiseptics;
6 Arsenicals (organic)
7 Analgesics, anaesthetics, antipyretics and spasmolytics,
8 Barbiturates;
9 Blood preparations,
10 Cholagogues,
11 Diuretics,
12 Extracts,
13 Glycosides,
14 Insulin,
15 Insecticides and rodenticides;
16 Laxatives
17 Oestrogen and sex hormones;
18 Pharmaceutical preparations,
19 Plant hormones,
20 Sulphonamides,
21 Sweetening agents;
22 Tuberculocides;
23 Vitamins

New Indian Drugs for Skin Diseases

Two new drugs from the medicinal neem tree have been evolved at the Indian Council Scientific Research Laboratory. Tests are said to have shown that these drugs, Nimbidin and an allied compound sodium nimbidinate, can be effective in the treatment of skin diseases such as eczema, septic sores, etc. They can also be applied as a gargle for sore throats.

U.S. INDUSTRIAL PROJECTS

Antibiotics, Detergents and Metals

THE National Distillers' Chemical Corporation, which in June began producing metallic sodium in its new $10 million plant at Ashtabula, Ohio, has devised new techniques for sodium dispersions that are claimed to make it easier to control sodium reactions in the sodium user's own plant for either laboratory or full-scale operations, and substantially to accelerate the reaction rate. Reaction temperatures can, it is stated, be lowered with corresponding increase in yield. These sodium dispersions, it is pointed out, make possible new reactions which formerly were limited by decomposition at the temperature required to obtain a suitable rate. They can be handled at room temperature. The metallic sodium is dispersed in inert media that boil at temperatures higher than the melting point of sodium and contain up to 50 per cent by weight of sodium metal. The dispersions are made in suitably modified colloid mills. Sodium is dispersed in such inert media as toluene, xylene, naphtha, kerosene, white oil. petroleum jelly, naphthalene or paraffin. Particle sizes ranging from submicron to 20 microns, with an average of 2 to 3 microns, are said to be easily obtainable.

* * *

The chemical furfural, produced from farm wastes, is now being used by Eaton Laboratories, Ltd., of Norwich, New York, to develop a new group of furane drugs, including a germicide, a fungicide and an anti-histamine drug. U.S. scientists believe it may possibly prove to be the starting point for a new range of chemicals, comparable to benzene, on which much of the modern drug, dye and plastics industries are based. The germicide made from furfural, Furacin, is being considered as a synthetic antibiotic in the class of penicillin, and it is claimed that its kills some germs that penicillin does not.

Production of lauryl sulphate detergent is to be started soon by U.S. Industrial Chemicals, Inc., in a new plant in Baltimore, Maryland. The new liquid detergent, Sipon L-20, is the first surface active agent to be marketed by this company as the result of the programme undertaken jointly by the American company and Société Sinnova, of Paris. The detergent is particularly recommended for use where high foam and detergency and mild action on the skin are desired.

LIFE-SAVING CHEMICALS

BMA President's Review

ADDRESSING the 18th annual meeting of the British Medical Association recently, Sir Henry Cohen spoke of the reduction of mortality in the course of certain diseases which some of the new drugs had made possible. In his address following his election as president of the BMA, Sir Henry said: "As an example of the benefits which recent therapeutic advances bring to the individual patient rather than the community, let me quote first the effects of sulphonamides in pneumonia. Flippin *et al.* reported in 1943 that of 1906 cases of pneumonia treated before sulphonamides were introduced the mortality was 40.1 per cent; of 1635 cases treated after the introduction of sulphonamides only 10.6 per cent died.

"In another series recorded by Ungeleider and his colleagues in the same year the pneumonia mortality rate for 1935 to 1937 before sulphonamides were used in treatment was 20.8 per cent. In 1938 the case mortality was 79 per 100,000. In the period 1938 to 1942 the case mortality had been reduced by the use of sulphonamides to 3.9 per cent, which represented for 1942 a death rate of 32 per 100,000. Thus in the United States alone 25,000 lives had been saved yearly by the sulphonamide drugs, and the reduction in the length of illness resulting from treatment had added at least a million days to the working capacity of the nation.

Sulphonamides in Meningitis

"In the American Civil War the death rate from meningococcal meningitis was estimated at about 90 per cent; towards the latter part of the first world war, when antimeningococcal serum became generally available, the mortality was reduced to about 30 per cent; in the second world war treatment with sulphonamides reduced the mortality to under 3 per cent.

"The triumphs of penicillin and other antibiotics have been too recent in the memory to justify repetition, and as yet only the fringe of their potential usefulness appears to have been reached. If an example need be chosen to illustrate the benefits of chemotherapy, few would be more informative than that of puerperal sepsis. Before the sulphonamide era the puerperal sepsis crude death rate was 154 per million; in 1939, when sulphonamides were in general use, this dropped to 68; in 1947, when penicillin was readily available, the rate had fallen to 16—a decrease of 90 per cent in less than 15 years."

A NEW FLOW VALVE

Original Use of Liquid Pressure Principles

A NEW flow valve of very original design was the subject of demonstrations for the information of the technical Press at research laboratories at Redhill Aerodrome, Surrey, on July 27. The organisers, Tiltman Langley Laboratories, Ltd., have produced specimen valves but do not propose to manufacture them commercially. The object is to design such valves, suitably modified, for any specific industrial purposes.

The valve is a compact and completely glandless unit which can be remotely controlled by pneumatic, hydraulic or electrical means. The valve offers low resistance at all rates of flow and pressures and it can operate at high pressures and at swift flow speeds.

Its small cross-sectional size enables the valve to be installed in a pipe run without requiring special clearances between adjacent pipes, and the "straight-through" flow avoids pipe bends or constrictions.

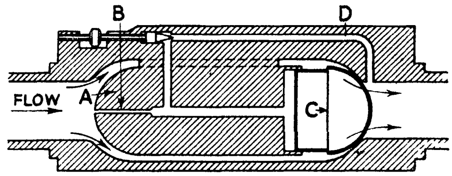
Because the valve is glandless, there is no risk of fire when inflammable liquids are handled; since the valve can be fabricated from any material—even glass or carbon—there is no danger of corrosive liquids attacking the valve components or leaking from it. Acids, alkalis, steam and gas flows may be handled with safety.

The valve lends itself to easy remote control. Without power services, remote control can be obtained up to 15 ft. merely by utilising the fluid flow pressure. Electrically operated, the valve will control flows of 30 g.p.m. at pressures up to 500 p.s.i., using only 0.33 amp from a 24 V supply.

Possible Applications

There appear to be many possible applications for the valve: for handling corrosive materials; for remote control of water or gas supplies; fire sprinkler systems—using the valve operated from fusible plugs to supply water immediately at high pressures. This does not, of course, exhaust the range of possible uses.

In the accompanying diagram, showing the valve in its basic form, it will be seen that the chamber houses a central component A, supported by three radial webs. The body is spherically shaped at the input end and has a supply hole B drilled through it centrally. This connects with



Tiltman Langley flow valve

a piston chamber at the outlet end of the central component, in which moves a piston C, which is spherically ended and shaped like a mushroom.

Connecting the upstream end of the piston to the outlet of the valve is a by-pass D. When the by-pass is closed, the pressure built up against the piston is greater than the flow pressure acting on the downstream end. The piston therefore moves to close the main flow and seats against the outlet wall of the valve body. The piston is held here because the load on the piston is greater than the load over the resisting area round the spherical end of the piston. The difference of pressure is the measure of effective sealing.

Opening the by-pass will relieve the load on the piston, the pressure being dissipated through the by-pass more quickly than the build-up achieved through the supply hole B, which is deliberately throttled to obtain this effect. The load on the piston face therefore becomes less than that at the spherical end and the piston moves back, opening the flow passage to the main fluid flow. The higher the main flow pressure, the quicker will the valve open.

By adjusting the throttle B, the rate of operation can be controlled. Throttling B, for example, will prevent hammer in the valve.

Glass Tubing Cutter

A SIMPLE glass tubing cutter for the laboratory and workshop is among the latest additions to equipment provided by Griffin and Tatlock, Ltd. The cutter, made of aluminium alloy, has a base shaped to hold tubing in a vee under the cutting wheel. Six rustproof steel cutting wheels are kept inside the hollow cutting arm. Another new item described in leaflets just issued by the company is the G & T Modulat electrically heated oven for drying, incubating or sterilising.

USING THE CONSULTANT

Functions of an Inadequately Defined Service

by a CONSULTANT CHEMIST

ONE dictionary defines a consultant as "one who consults." If this is true, then the independent consultant might, more properly, be called a consultee, because he is the person actually consulted. However, "A rose by any other name would smell as sweet" and it is not our intention to dogmatise on minor details of terminology.

What is it that prompts a person to seek the services of a consultant? In many cases it is because an executive finds the burden of his responsibilities too great for him and he wishes to have them eased, in part, at any rate. There are, moreover, certain times when it is politic for the executive to be able to say that he has taken independent and expert advice on some special topic. Consultants undertake a considerable amount of arbitration work, varying from a relatively simple piece of analytical chemistry to decide the correct amount payable for a consignment of merchandise, to the resolution of major problems, requiring decision and opinion.

There is also the equally important duty of acting as an expert witness whose evidence in court can help the judiciary in ensuring that not only is justice done, but that it appears to be done.

The above are, principally, short-term problems, but there is the other side of the picture to be considered; for example, the design of large and extensive installations. This usually involves intensive research and far-sighted planning, and the consultant may need a large staff to aid his handling of such a task.

Multifarious Advice

Because a consultant may be called upon to give advice on plant design, erection and maintenance; medical and legal matters; research and development; marketing; safety; and a host of other things, it is not surprising that there are so many different types of consulting practices. There is hardly a single branch of industry or commerce in which the services of a variety of consultants are not in regular use.

The first essential for a consultant is that he should have a broad outlook, not a parochial one. He is expected to be absolutely independent, impartial and unbiased in everything he may say or do. The consultant should, of course, have a high sense of professional integrity and sufficient skill and experience to gain and keep the confidence of his clients.

Much has been said, and will no doubt continue to be said, about the apparent uselessness of some consultant service. This aspersion usually arises because the client has not told the consultant the whole story, possibly having left him to grope, as it were, in complete or semi-darkness by withholding some essential detail about the background of the problem.

Data Withheld

There is a case on record of a chemist having been invited to ascertain the cause of some uneven dyeing, who was not allowed to make any inspection of the dyehouse. This left him in the invidious position of being able to report only that there was more dyestuff on the deeper coloured parts than on the paler. He was thus, through no fault of his own, unable to find out the true cause. The uneven dyeing was, in fact, due to a fault in a hydro-extractor.

Another case has been quoted in which an expert was invited to examine the methods used for the manufacture of a non-chemical product, involving a number of stages. After much detailed study, including a considerable amount of experimental work, he was able to report only that, in his opinion, no alterations were necessary, neither could he suggest any means which would significantly improve the quality of the finished product. A report of this nature was regarded by the clients as very unsatisfactory because it had been costly, and they had derived nothing from it. Such a difficult position could perhaps have been eased by the consultant, before undertaking the task, by indicating that the client might only have, as the result of the consultant's work, the satisfaction of knowing that his plant was efficient and his product as good as contemporary knowledge could make it.

How should one set about obtaining the services of a consultant? As a professional man, the normal channels of public advertisement are not generally used by consultants here, although there is certainly nothing undignified or unprofes-

sional in some small panel advertisements which in the U.S.A. regularly appear in *Industrial and Engineering Chemistry*. These announcements, all appearing together in one place, give a prospective client very useful guidance in his choice. A number of professional bodies keep lists of members who are independent consultants. Such information is readily available from the Royal Institute of Chemistry and the Institution of Chemical Engineers. The journals serving chemical industry also have a considerable acquaintance among consultants and are generally very willing to make that knowledge available to those who need it. In chemical consultancy there is fortunately no artificial barrier to prohibit a direct approach between consultant and client, comparable to that which complicates securing specialist advice in medicine or the law. The chemical manufacturer who has decided to pay the piper can usually discuss the tune without resort to an intermediary. That system has the considerable merit of minimising the total cost.

Fees

The fee paid a consultant is generally a mutual arrangement between the parties, and depends on the extent of the work involved and the degree of skill required to carry it out. It may parallel the legal basis of a fee and a "refresher" when this becomes necessary. It is usual for the fee to be paid at the end of the work but in the case of a long inquiry it may be more convenient to arrange for an account to be submitted periodically.

Should the client wish to have the sole call on the consultant's services for a period, then the consultant will clearly be entitled to a retainer. This retainer can in no sense be regarded as being in lieu of fees. Its purpose is to compensate the consultant for any loss of profit he sustains while he is precluded from serving some other firm. The terms of the retaining fee will, of course, indicate the directions in which the activities of the consultant may be restricted.

In the design and erection of large plants, the fees are usually based on the cost of the work, with an appropriate minimum. Such a fee is usually paid in a limited number of instalments, as the work proceeds. The Association of Consulting Engineers has detailed a scale of fees considered suitable for the above type of work, with specimen forms of agreement covering the work done and the arrangements for payment.

One model form of agreement recommended by the association stipulates that the consultant's fee shall be calculated on the actual cost of the work, and for intermediate payments the amount should be calculated upon the best cost estimate available at the time. This schedule provides two categories, undertakings costing less than £75,000 and those costing more than £75,000.

In the first category the payment to the consultant would be :—

On the first £2500	10 per cent
On the next £7500	8½ ,,
,, £25 000	7 ,,
On all further cost	6½ ,,
OVER £75 000	
On the first £75,000	7 ,,
On the next £125 000	6 ,,
,, ,, £300 000	5 ,,
On all further cost	4½ ,,

So far, little has been said of the duties which the consultant owes to his clients. They are in principle very simple. He should regard his client's affairs as confidential to himself; he should do his best to serve the client's interests. He should be impartial and truthful, even though the advice he must offer may not be very welcome to the client.

The few more or less authoritative pronouncements relating to the ethics of consulting work all follow similar lines. The Royal Institute of Chemistry refers to this matter in its bye-laws and also in its charter. The American Institute of Chemical Engineers allows its code of ethics to be reprinted in full in Perry's "Chemical Engineers' Handbook." This code lays special stress on the confidential nature of the work and of the results obtained, and also the importance of upholding the dignity of the profession. The Association of Consulting Engineers binds its members to a very strict code which covers the relations not only between the consultant and his client, but between one consultant and another. Study of these documents clearly shows the high standard of professional conduct required of the consultant. One has every reason to believe that those consultants one knows abide by these codes of behaviour, and are anxious to ensure that members of the profession should be known for their integrity as well as their competence.

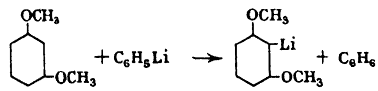
As a general rule, consultant service is of great value to smaller firms, the scope of whose activities is not sufficient to permit the maintenance of large research departments. In such instances, the consultant is frequently employed to guide and direct a small technical staff, whose limited experience renders the supervision by an expert valuable, if not indispensable.

ORGANO-LITHIUM COMPOUNDS—II

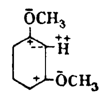
Some Important Common Reactions

by R. W. MONCRIEFF

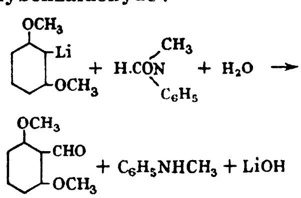
GRIGNARD reagents will not ordinarily replace hydrogen atoms that are bound to carbon atoms, but organo-lithium compounds will sometimes replace the hydrogen in a benzene nucleus. Thus resorcinol dimethyl ether forms 2,6-dimethoxyphenyl-lithium in 70 per cent yield even in the cold.



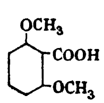
The replaceability of this nuclear hydrogen may seem surprising but it should be noted that it is made labile by the proximity of the two ether groups, whose polarity effects reinforce each other and tend to make the hydrogen labile. This may be illustrated:—



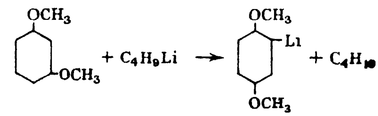
It is to be noted that lithium metal would not directly replace the hydrogen in resorcinol dimethyl ether; only when it is present as an organo-lithium compound, such as phenyl-lithium can it do this. Once the hydrogen atom has been replaced by the lithium from the phenyl-lithium the required group can be inserted. Reaction with, for example, N-methyl formanalide will give 2,6-dimethoxybenzaldehyde:—



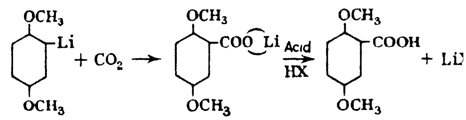
Gilman, Willis, Cook, Webb and Meals[6] have made 2-6 dimethoxybenzoic acid,



by a similar method; they reacted butyl-lithium with the dimethyl ether of resorcinol and then carbonated the lithium compound with solid carbon dioxide. The reactions may be written:—



and then



An example of a coupling reaction similar to the Wurtz-Fittig is to be found in the reaction of phenyl-lithium with benzyl bromide, which results in the formation of dibenzyl.

$$C_6H_5CH_2Br + C_6H_5Li \rightarrow C_6H_5CH_2Li + C_6H_5Br$$

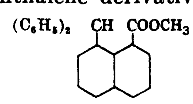
$$C_6H_5CH_2Li + C_6H_5CH_2Br \rightarrow \underset{\text{Dibenzyl}}{C_6H_5CH_2CH_2C_6H_5} + LiBr$$

Whereas magnesium organo compounds will not add to an olefinic linkage, the corresponding lithium compounds will. Ziegler, Crössmann, Kleiner and Schäfer[7] showed that butyl-lithium would add on to 1,1-diphenylethylene

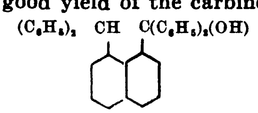
$$(C_6H_5)_2C{=}CH_2 + C_4H_9Li \rightarrow (C_6H_5)_2\underset{\displaystyle Li}{\underset{|}{C}}CH_2C_4H_9$$

The lithium atom can then be replaced by hydrogen, alcohol, aldehyde, or carboxyl group.

Some carbonyl derivatives will not react with magnesium compounds because of steric hindrance, but will nevertheless react with organo-lithium compounds. One such case was reported (among others) by Wittig and Petri;[8] it is that of the naphthalene derivative

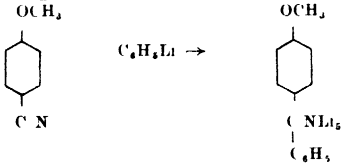


1-benzhydryl-8-naphthoic methyl ester, which reacts with phenyl-lithium, rapidly giving a good yield of the carbinol

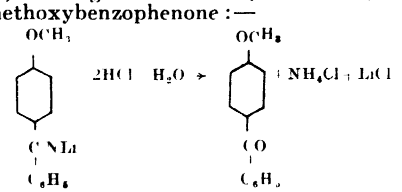


1-benhydryl-8-(diphenyl-hydroxymethyl)-naphthalene.

The addition of methyl-lithium and phenyl-lithium to nitriles is also noteworthy. Gilman and Kirby[9] showed that they would give isolatable products. Thus anisonitrile reacts within phenyl-lithium, both being in ether solution:—



within 30 minutes and on treatment with acid, this gives an 85 per cent yield p-methoxybenzophenone:—



Similarly, methyl-lithium in ether solution gives with anisonitrile a 75 per cent yield of p-methoxyacetophenone. These reactions are particularly remarkable because anisonitrile (p-methoxybenzonitrile) will not react with Grignard reagents. Similarly p-dimethylaminobenzonitrile will not react with Grignard compounds, but does react readily with methyl-lithium or with phenyl-lithium.

α-Alkenyl Lithium Derivatives

Braude, Coles and Timmons[10] quite recently reported the preparation of α-alkenyl lithium derivatives and their use in synthesising unsaturated compounds. Hitherto this class of reagents has been almost unknown, the only example that had been reported was styryl-lithium, which Wright[11] had stated to be formed no more easily than the magnesium derivative.

It is a limitation of the Grignard syntheses that alkenyl halides containing a halogen atom adjacent to an ethylenic bond can be converted to the organo-magnesium compound only with difficulty. If, for example, vinyl bromide is treated with magnesium, it does not form a Grignard reagent, but instead loses the elements of hydrobromic acid to give acetylene, as was shown by Krestinsky[12]

$$2CH_2{:}CHBr + Mg \rightarrow 2CH{:}CH + MgBr_2 + H_2$$

The only exceptions to this behaviour have been some of the aryl vinyl compounds such as β-bromostyrene, which Wright (*loc. cit.*) had found to react with aldehydes in the presence of magnesium to give in small yields some of the expected carbinols. In the main though, halogen atoms adjacent to ethylene bonds have been unable to pick up magnesium and form a Grignard reagent; this has sometimes excluded what would otherwise have appeared to be a simple and attractive synthesis.

Braude, Coles and Timmons have, however, found that the corresponding lithium derivatives can be obtained much more easily than the magnesium derivatives and have thus opened up a new synthetic route for the synthesis of ethylenic compounds, one that may be of considerable value. They found that highly purified isobutenyl bromide reacted readily with lithium metal in dry ether to give isobutenyl lithium:—

$$(CH_3)_2C{:}CHBr + 2Li \rightarrow (CH_3)_2C{:}CHLi + LiBr$$

When the resulting solution was carbonated with solid CO_2 some of the organo-lithium compound which was formed reacted with the isobutenyl chloride to give dimethyl-hexadien:—

$$(CH_3)_2C{:}CHLi + (CH_3)_2C{:}CHBr \rightarrow (CH_3)_2C{:}CH{\cdot}CH{:}C(CH_3)_2 + LiBr$$

Dimethyl hexadien

and the remainder formed β:β-dimethyl acrylic acid:—

$$(CH_3)_2C{:}CHLi + CO_2 \rightarrow (CH_3)_2C{:}CHCOOLi \rightarrow (CH_3)_2C{:}CHCOOH$$

and also phorone by reaction of the carboxylate with a second molecule of isobutenyl-lithium:—

$$(CH_3)_2C{:}CHCOOLi + (CH_3)_2C{:}CHLi \rightarrow (CH_3)_2C{:}CHCOCH{:}C(CH_3)_2 + Li_2O$$

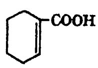
In this particular instance the yields of the three products were: 2:5-dimethyl hexa-2:4-diene, 35 per cent; β:β-dimethyl acrylic acid, 7 per cent; phorone, 15 per cent.

It will be noted that isobutenyl bromide $(CH_3)_2C{:}CHBr$ is a compound that cannot readily be dehydrobrominated, but the method just described can be used satisfactorily with other compounds whose formulæ suggest they could undergo dehydrobromination, but which when treated with lithium do not do so. Thus propenyl bromide

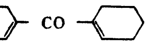
$CH_3CH{:}CHBr$ (β-methyl vinyl bromide)

apparently could easily lose the elements of hydrobromic acid, but it does not do so when treated with lithium in ether; instead propenyl-lithium $CH_3CH{:}CHLi$ is formed, together with a small proportion of propynyl-lithium $CH_3C{:}CLi$. Even the chlorides can sometimes be used instead of the bromides, *e.g.*, 1-chlorocyclohex-1-

enyl chloride, if treated with lithium and then with carbon dioxide, is converted into a mixture of cyclohex-1-ene-1-carboxylic acid,



and di(cyclohex-1-enyl) ketone



in an overall yield of 50 per cent.

The α-alkenyl lithium derivatives in general readily undergo the (usual Grignard) expected reactions with the following classes of compounds:—

1. Aldehydes and ketones to give ethylenic compounds, *e.g.*, (a) propenyl-lithium and benzaldehyde give the carbinol $CH_3CH:CHCH(OH)C_6H_5$ in 35 per cent yield.

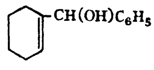
(b) isobutenyl-lithium and acetophenone yield the carbinol $(CH_3)_2C:CH.C(CH_3)(OH)C_6H_5$ in 33 per cent yield.

2. Carboxylic acid derivatives to give ethylenic ketones, *e.g.*,

(a) isobutenyl-lithium and lithium benzoate give isobutenyl phenyl ketone $(CH_3)_2C:CH.COC_6H_5$ in 40 per cent yield.

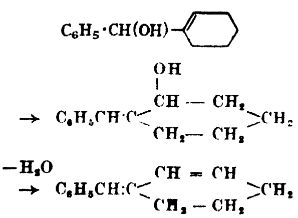
(b) isobutenyl-lithium and lithium acetate give isobutenyl methyl ketone, $(CH_3)_2C:CHCO.CH_3$ in 36 per cent yield.

It is clear that the existence of α alkenyl-lithium compounds and the reactions they will undergo afford a new and valuable synthetic method for the preparation of ethylenic compounds. It is even more valuable because many of the unsaturated compounds that are obtained will undergo functional reactions and molecular rearrangements leading to other unsaturated systems. An example of this is afforded by the new compound:—



is made from cyclohex-1-enyl-lithium and benzaldehyde.

This compound rearranges as follows:—



Organo-lithium compounds have become one of the most useful synthetic aids. Similar in principle to the Grignard magnesium compounds, they will, owing to the much greater lability of the lithium atom, undergo rapidly many reactions that magnesium compounds make sluggishly and they will often react easily under conditions which permit no reaction with magnesium compounds. At the same time, the lithium atom is less reactive than sodium or potassium under similar conditions, so that whereas it is mostly impossible to isolate the organo-sodium derivative, the organo-lithium derivatives can be kept for months in solution. The lithium atom appears to possess approximately the maximum reactivity which will still permit the reaction to be stopped at the organo-lithium stage.

Such compounds as methyl-lithium, and phenyl-lithium have opened the way to many organic syntheses, and a great variety of compounds can be synthesised by their aid. All the resources of the Grignard reagent (or nearly all) are available to the lithium syntheses with the great advantage of much enhanced reactivity; often this enhancement is so great that it will overcome such steric hindrance as entirely precludes reaction with the magnesium compound.

The increase in reactivity has to be paid for by the necessity of conducting operations under an inert atmosphere; usually cylinder nitrogen which has been well-dried is satisfactorily inert.

One limitation that had, until very recently, characterised the use of organo-lithium compounds was that derivatives with the lithium atom adjacent to an ethylenic bond were almost unknown. Work very recently published has shown that this limitation has been overcome. The scope for the use of organo-lithium compounds, already very great, has thus been considerably increased.

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Record Total of U.S. Sulphur

The U.S. domestic sulphur industry produced 475,694 long tons during May, according to reports of producers to the U.S. Bureau of Mines. This was the greatest tonnage ever produced in a single month.

Metallurgical Section

Published the first Saturday in the month

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5 August 1950

PRODUCTION & PROPERTIES OF COBALT

Increasing Applications of a Versatile Element

by R. S. YOUNG, Ph.D., F.R.I.C.*

COBALT, element 27 in the periodic table, was known in its crude state to the copper miners of the Hartz Mountains in the sixteenth century and was recognised as a metallic element around the middle of the eighteenth century. Its history well illustrates the shifts in major ore sources so frequently found in the mining industry. Up to the latter part of the last century the small output was derived almost entirely from Germany, Norway, and Hungary. About 1874, oxidised cobalt ores were exploited in New Caledonia and that territory was the leading producer until the beginning of the twentieth century saw the development of the rich silver-cobalt ores of Ontario, Canada.

Belgian Congo Development

For twenty years Canada led in cobalt, but about 1920 Union Minière du Haut Katanga began to extract cobalt from its copper-cobalt ores in the Belgian Congo, which soon became, and still remains the largest producer of cobalt. In 1930 the development of the immense copper resources of Northern Rhodesia revealed that one producer, Rhokana Corporation, had enough cobalt to warrant extraction. Since then Northern Rhodesia has been second in world output.

In the mid-thirties the cobalt deposits of French Morocco began to assume importance, and prior to the war they were in third place. Minor producers include Canada, United States, Finland, Burma, Australia, and several other countries. It is interesting to note that over 75 per cent of the world's cobalt comes from the continent of Africa.

The smelter at Nkana

Cobalt occurs in the form of sulphides, oxides, and arsenides and is generally associated with ores of copper, nickel, arsenic, or silver. Over 50 minerals containing cobalt have been described in the literature, and the content of cobalt in the earth's crust is usually estimated at 0.001 per cent, or 1/20 that of nickel. The principal sulphides are carrollite $CuCo_2S_4$, and linnaeite Co_3S_4; the chief oxides include asbolite $CoO.2MnO_2.4H_2O$, and heterogenite $CoO.2Co_2O_3.6H_2O$; the main arsenides are safflorite and smaltite $CoAs_2$, skutterudite $CoAs_3$, and erythrite $Co_3As_2O_8.8H_2O$.

The metallurgy of cobalt, depending on the nature of the ore, may include practically all the typical operations of this science. Concentrating practices may entail gravity, magnetic, or flotation concentration; furnace operations occur in the roaster, blast furnace, reverberatory, or electric furnace; while the hydrometallurgy of cobalt embraces all types of leaching, purification, precipitation, or electrolysis.

(continued overleaf)

* Director of Research, Diamond Research Laboratory, Industrial Distributors (1946), Ltd., Johannesburg The author, who is chief research chemist, Anglo-American Corporation of South Africa, has written a monograph on cobalt for the American Chemical Society. He is also chief research chemist of the Rhokana Corporation, Ltd ; Nchanga Consolidated Copper Mines, Ltd ; and Rhodesia Broken Hill Development Co , Ltd.

In the Belgian Congo the oxidised cobalt residues from copper leaching operations are purified by removing copper and iron, and cobalt is finally obtained by electrolysis of its sulphate. Some high-grade cobalt ores and by-products are treated in electric furnaces to give a copper-cobalt-iron alloy. In Northern Rhodesia where cobalt occurs as a sulphide, differential flotation and gravity separation followed by separate treatment in reverberatories and converters gives a high cobalt slag. This feeds the electric furnaces to produce copper-cobalt-iron alloy. Where cobalt occurs in the form of arsenides as in French Morocco and Canada, blast furnace and roasting operations give a product amenable to leaching with sulphuric acid.

Separation Processes

The hydrometallurgy of cobalt usually begins with a dilute acid solution containing cobalt, copper, iron, and frequently nickel and arsenic, which has been obtained by leaching an alloy, matte, or cobalt-containing residue with sulphuric acid. Copper can be removed by precipitation on scrap iron, while iron is eliminated as hydroxide, or arsenate if arsenic is present, by additions of lime under careful pH control. Cobalt is separated from nickel by taking advantage of the fact that in neutral solutions cobalt is more readily oxidised by agents like sodium hypochlorite, and the oxidised compound hydrolyses and precipitates, leaving nickel in solution. Cobalt hydrate is reduced to metallic cobalt by carbon.

In conformity with most metals, the trend in cobalt production is towards treatment by electrolysis to obtain as pure a final product as possible. Most of the Congo production is now electrolytic, and the Northern Rhodesian output likewise should be the product of an electrolytic process within a year or two.

Cobalt Ammines

The chemical properties of cobalt and its principal compounds are similar to those of its neighbouring base metals, iron and nickel. A large number of complex ammonium compounds with cobalt are known, and in fact many cobaltic salts are not found in the free state and are only known by their ammines.

In its physical and mechanical properties metallic cobalt resembles iron and nickel. All analytical chemists must have been impressed at some time with the colour phenomena of cobalt salts in aqueous solution. The colours have been attributed to changes in solvation or hydration, to degree of saturation of the residual valencies of the cobalt ion, or to the presence of cobalt complexes.

Cobalt is an important alloying element for steels. The best types of tool steels, for taking heavy cuts at high speed on hard materials, generally contain 8 per cent cobalt in addition to the usual tungsten, chromium, and vanadium. Cobalt is a basic constituent of magnet steels, the best type in commercial use containing 35-40 per cent cobalt. The Alnico-type magnets contain from 5 to 35 per cent cobalt depending on their intended use.

In the ferrous field other important uses for cobalt include alloys for high-strength, high-temperature service, for glass-to-metal seals, and in an alloy possessing zero co-efficient of expansion.

In non-ferrous alloys cobalt mixes well with aluminium, beryllium, chromium, molybdenum, nickel, silicon, tungsten, and vanadium. Stellite, a cobalt-chromium-tungsten alloy, and Vitallium, a cobalt-chromium-molybdenum composition, are widely used for high-temperature service. It is no exaggeration to say that developments in jet propulsion and aircraft gas turbines up to the present have been largely dependent on the cobalt-base alloys.

The importance of cobalt in the field

Diamond-impregnated tungsten carbide drill crown, having a cobalt content of 15 per cent

of cemented carbides, is as the binder or matrix for the particles of tungsten and other carbides. It is the most satisfactory metal to bond tungsten carbide, and large numbers of key tools in industry, such as lathe tools, grinding wheels, dies, depend on 5-20 per cent cobalt in the cement carbide. Cobalt is one of the best materials to bond with the diamond, and its presence is the cause of the strong attachment of diamonds to a tungsten carbide matrix.

Though cobalt plating itself has not proved of any commercial merit, " bright nickel " plating, in which cobalt is added to nickel, has attained increasing significance in recent years. The addition of cobalt, with nickel formate and formic acid, to the electrolyte gives smooth, bright, hard, ductile deposits of high protective value.

Glass and Ceramic Colorants

The glass and ceramic industry is greatly indebted to cobalt for one of its most satisfactory colouring agents. Oxidation and reduction in the melt have no effect on the colour, the latter is stable at high temperatures and is unaffected by the presence of silicates. A range of all shades of blue is imparted to glasses and ceramic glazes by varying quantities of cobalt, with or without the addition of other elements.

Another important use for cobalt is to promote the adherence of enamel to steel. There is not an adequate explanation for this effect, and a great deal of research on substitutes for cobalt for this purpose was done in Germany during the war, but without success.

In the broad field of catalysis, cobalt has many important applications. Cobalt salts, usually linoleates or naphthenates, are the best driers for paints and varnishes. Cobalt is the most satisfactory catalyst for the Fischer-Tropsch synthesis of liquid hydrocarbons from carbon monoxide and hydrogen. During the past few years the use of fluorocarbons for the separation of uranium isotopes has emphasised the importance of cobalt in the synthesis of fluorocarbons. CoF_2 is changed to CoF_3 by passing fluorine over it, and CoF_3 reacts with hydrocarbons to replace hydrogen with fluorine.

Biological Value

A fascinating use of cobalt in recent years has been to prevent deficiency diseases of livestock in many parts of the world. In Australia, Britain, Canada, Kenya, New Zealand, and the United States puzzling diseases of both cattle and sheep were finally traced to a cobalt deficiency. The addition of small quantities of a cobalt salt to livestock feed or to soil is now standard practice in many regions.

Until recently, cobalt, an element known for nearly 400 years, appeared to make slow progress in the arts and industries. As late as 1914 practically all the world's cobalt was sold in the form of oxide for ceramic purposes. Its rapid extension into many fields in the past 35 years is a good augury for the future of this versatile metal.

Developing Canada's Cobalt

SUBSTANTIAL progress is reported in the production of metallic cobalt by the Cobalt Chemical and Refinery Co., at its plant near Cobalt, Ontario, Canada.

The smelter was acquired from the Silanco Mining and Refining Company last year (THE CHEMICAL AGE, *61*, 895). This marked the launching of a new U.K. enterprise in North America as the new company is partially financed by British capital and the work is under the direction of British metallurgists and technicians.

Present efforts are concentrated on getting the plant into continuous commercial production, says a current report in *Foreign Commerce Weekly* (Vol. 39, No. 18). The product so far is believed to contain a rather high percentage of slag but, with the substitution of an electric furnace for the oil furnace now in use in the final reduction process, a product running 97 per cent cobalt is foreseen.

Almost the entire smelter feed of about 10 tons daily is being taken from a 600-ton stockpile built up during earlier operations.

At Silanco's Aguanico mine in Bucke township an estimated 40,000 tons of drilled indicated cobalt ore is under development. When this programme is completed, Silanco plans to use 75 per cent of the capacity of its Colonial Mill for treatment of cobalt ore, with an expected monthly output totalling 90 tons of cobalt concentrate.

In a further development, the Mensilvo mines at Coleman township is operating a 25-ton concentrator and producing about 30 tons of concentrates monthly. Equipment to enlarge its capacity is now being installed for milling 25 tons or ore daily.

SILVER IN CHEMICAL PLANT CONSTRUCTION

Some Modern Applications

A centrifuge basket, 36 in. diameter, with an electrodeposited covering of pure silver, used for the separation of a pure vitamin

THE wider use of silver in the construction of chemical plant has hitherto been hampered by price considerations and by the traditional tendency to look upon the material as a precious metal rather than an industrial component. Up to 50 years ago the price ratio of silver to gold was maintained fairly constantly at approximately 1 to 15. Following the demonetisation of silver, however, the price declined and by 1939 the ratio of silver to gold had fallen to 1 to 100. Prices have since been subject to sharp fluctuations resulting from artificial factors and controls, but at current levels silver can be more economically employed in chemical plant than several other corrosion-resistant materials. Increased consumption by the chemical, electrical and foodstuffs industries may be expected to result eventually in price stabilisation at an economic level for industrial users.

Silver has many valuable properties, some of which are unique. Of particular importance to chemical engineering are its high resistance to corrosion and its softness and ductility after annealing, which render it exceptionally well suited to various fabricating operations.

Silver is unaffected by alkaline solutions and by fused alkalis up to quite high temperatures, resists attack by most organic acids, and has a higher resistance to acetic acid and acetic anhydride both in the liquid and vapour phases than any other metal in common use. Though hot sulphuric acid and all concentrations of nitric acid readily attack silver, more dilute sulphuric acid and phosphoric acid solutions have little effect even at boiling point.

The halogen acids produce a film of silver halide on the surface which inhibits further attack, unless the acid is sufficiently concentrated to dissolve the film. Silver is not subject to the formation of oxides at both normal and elevated temperatures but is attacked by most sulphur compounds. This resistance to attack over a very wide range of conditions rarely depends on the formation of a protective film; it is due chiefly to silver's high position in the electro-potential series, which is exceeded only by the standard potentials of gold and the platinum group metals.

Of major importance in many chemical applications is the fact that silver has a higher thermal conductivity than any other metal. At room temperature the figure is 1.00 cal/(sec.) sq. cm. (°C. per cm.), compared with a figure of 0.94 for copper. This outstanding property plays a valuable part in dissipating the heat generated at electrical contact interfaces.

High Thermal Conductivity

The heat transfer characteristics of silver and silver-lined chemical plant compares favourably, for example, with those of nickel or stainless steel plant. In favourable conditions, the high thermal conductivity of silver, coupled with its freedom from corrosion, enable very high overall transmission coefficients to be obtained. At 0.056 cal/gm per °C. at 20°C. the specific heat of silver is much lower than that of copper.

The ultimate tensile strength of fully annealed silver is about 20,000/sq. in., while in the work hardened condition it is of the order of 40,000 to 45,000 p.s.i. To overcome its mechanical weakness and liability to sulphur tarnish silver is alloyed with copper and various other metals. In nearly all the available alloys, however,

improved mechanical strength is accompanied by a reduction in the resistance to chemical attack, so that for use under corrosive conditions 99.99 per cent silver is preferred. The subject of alloying, however, has not yet been fully explored. Dr. J. M. Pirie has expressed the opinion that sufficiently active development of certain lines of investigation could yield an alloy which would combine the characteristic corrosion resistance of fine silver with mechanical properties of a reasonably high order.

Both the pure metal and its alloys can be rolled, spun, drawn, etc., the accepted practices differing little from copper technique. Solid drawn tubes are produced up to 2 in. in diameter, tubes of a larger size normally being welded from strip. A number of tubular liners for autoclaves have been constructed, however, each liner being a solid drawn silver tube 30 ft. long, 20 in. diameter and of $\frac{3}{8}$ in. wall thickness. The billets cast for these tubes weighed nearly 2 tons each.

Bonding Property

One of the most important properties of silver is the ease with which is can be welded or bonded at only slightly elevated temperatures. Pure silver is therefore used to a certain extent as a bonding material in the manufacture of chemical equipment.

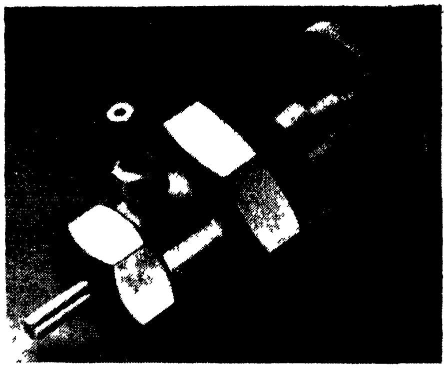
Since silver possesses a low specific heat, a fairly high coefficient of expansion and a high thermal coefficient, special provision has in some instances to be made to enable this expansion to take place without danger of buckling.

The use of solid silver for plant construction is, of course, limited by the cost of the metal and by its low tensile strength. Massive silver is therefore used mainly where thin-walled structures and low unit stresses are permissible. The principal application of this nature is in the construction of tubes and coils subject to low working pressures.

Fine Tubing

For service at higher pressures, silver tubes and pipes are backed with a stronger metal by drawing down together a pair of heavy-walled tubes, one of silver, the other of base metal. In heat exchangers the silver tubes are expanded to fit tightly in the tube plates, which are usually of base metal sheathed with silver on the contact face and through the holes. Fine silver tubing is extensively used in the form of coils for heating, cooling, and small-scale condensing operations.

Where all risk of contamination of the contents by base metals must be avoided small pans and vessels may be constructed



A diaphragm-sealed control valve for liquid bromine: all parts coming into contact with the working fluid are constructed of solid silver

entirely of silver. Solid silver, often in cast form, is used for small parts which cannot readily be lined, such as plug cocks and various pipe fittings. Small and complicated cover plates for pressure vessels are made in a similar manner.

Though the initial cost of silver plant is high, this is largely offset by the recovery value when a plant or vessel is taken out of commission. It may be more economical in the long run to employ solid metal even in thick sections, than to attempt to line difficult constructions.

Cladding Technique

Because of the relatively high cost of silver, however, the most widespread use of the metal in chemical plant is in the form of liners, pre-formed to fit a base metal shell or tube. The cladding or inlaying technique is also extensively used, to produce silver-clad copper, phosphor bronze and steel sheet, silver inlays or stripes, and silver-clad copper and other metals in wire and tube form.

Copper is the most widely used backing metal. In a standard type of steam-jacketed pan used in the food processing and other industries, the lining is made up, for example, from sheet about 0.03 in. thick. This is rolled and hand worked to shape, the edges of the sheet being joined by gas welding using a fine silver filler rod. The liner is made to fit closely in the shell and the surfaces to be in contact are coated with an alloy of low melting point. After the liner has been inserted the pan is heated and the silver pressed into firm contact. This method produces a strong bond which allows a high rate of heat transfer through the double wall and cannot easily be loosened at ordinary working

temperatures. Many complex shapes can be lined in this way. Mild steel vessels can also be given a bonded lining if the steel shell is not too heavy. Bonding is not practicable in thick-walled vessels such as high-pressure autoclaves, the method usually adopted being to make the liner slightly oversized and press it into place.

Jointing Methods

In general, the design of vessels or structures to receive a silver lining seldom presents any serious problems, nor is jointing difficult. The joint between the body and head is made by carrying the silver over flange faces and pulling up against a soft gasket by means of backing rings. Pipe joints may be made in the same way, or in the case of solid wall the methods applicable to copper piping may be employed. All jointing methods ensure that liquids or vapours in the system are in contact only with silver. Hence it is possible to build plant assemblies with silver contact surfaces throughout the system. Since silver surfaces easily bind together, special consideration must be given to parts such as agitator seals, cock and valve seatings, etc., which are in moving contact.

The fitted lining provides a very satisfactory working surface for many conditions and is readily recoverable, but there are disadvantages. Unless the lining is carefully bonded, there is a risk of collapse when working under vacuum, particularly at temperatures above 200° C., when the strength of the bonding medium is low. Moreover, the production, fitting and bonding of a liner into vessels of complex design adds considerably to the original labour of construction. Sheets less than 0.03 in. thick cannot be conveniently fabricated and handled, whereas for many applications ample protection would be afforded by a considerably smaller weight of silver.

Problem of Porosity

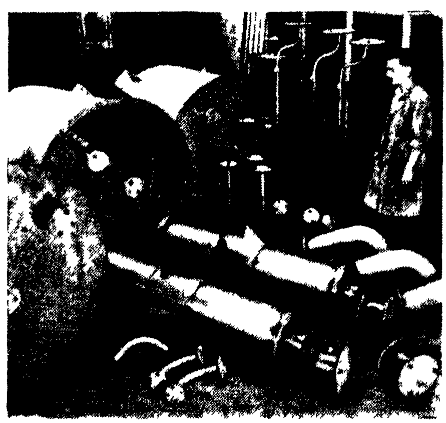
Uniform coatings of silver as thin as 0.001 in., or even thinner can be applied by electrodeposition or metal spraying, but are too porous for chemical process work. A homogeneous deposit may be obtained by carefully building a heavy layer, but even with thick coatings complete freedom from porosity is difficult to guarantee. This method is used for such articles as centrifuge baskets, paddles of Werner-Pfleider type mixers, and other work which cannot readily be sheet lined or made solid.

A promising method, likely to become important, is the cladding of a silver sheet on a base metal plate before fabrication. Under carefully controlled conditions a very strong bond is produced which enables the composite plate to be worked as a single element. Some difficulties still exist but once the technique has been mastered it seems probable that the first cost of silver-lined plant may be considerably reduced and its range of application extended.

The scope for silver or silver-lined plant is extremely wide. In inorganic processes the field is limited mainly by the inability of silver to resist attack by nitric acid and concentrated sulphuric acid. It is also limited by the availability of cheaper alternative materials. Silver is used, however, in handling cold hydrofluoric acid, dilute sulphuric and hydrochloric acids, etc., and has numerous applications in the manufacture of medicinal chemicals and pharmaceutical preparations. It is also used as a ladle and mould material for making very pure castings of sodium and potassium hydroxide, and in pipes and valves for handling chlorine.

Organic Processes

In organic processes silver is used in the presence of many acids, such as acetic and maleic acids, and in the presence of phenol and phenolic derivatives. One of the most extensive applications in this field is in the condensation and general handling of acetic acid, which at the moment of condensation is particularly corrosive. This caused considerable difficulty to manufacturers who used copper containers, but has been solved by the use of silver.



Multitubular condensers, cooling coils, vapour pipes and miscellaneous fittings all constructed of pure silver for an acetic anhydride plant. (The accompanying illustrations are reproduced by courtesy of Johnson, Matthey & Co., Ltd.)

CHROMATE PROTECTION FOR METALS

From A SPECIAL CORRESPONDENT

BICHROMATES and chromates have for a number of years found important applications in corrosion prevention and are still considered to be among the best inhibiting materials available in industry.

Chromate treatments for metals may be in the form of a dip or electrolytic processes, which are designed to inhibit or control the rate of corrosion of the metal or to promote the formation of a protective film. Probably one of the most easily applied and efficient anticorrosion methods for the protection of magnesium alloy surfaces consists of cleansing the metal by degreasing, immersing for 5 to 10 minutes in a 15-20 per cent solution (by weight) of hydrofluoric acid at 65° F., rinsing thoroughly with cold water and boiling for 45 minutes in a solution containing 10-15 per cent by weight of sodium bichromate (as dihydrate).

Corrosion Prevention

Tinplate to be used for canning also can be adequately protected against blackening caused by sulphur-containing food by immersion in an alkaline phosphate-chromate solution. This treatment reduces the amount of tin absorbed by the food and it also has the effect of retarding the rusting of tinplate in moist air.

An early use for sodium bichromate as an inhibiting agent which is still important is in refrigeration, where the introduction of this chemical in the circulating brine affords protection against corrosion. Usually percentages varying from ½ to 1½ per cent of the weight of sodium chloride or calcium chloride are effective, providing the pH of the brine is within 6.8 and 8.5 acid.

Generally, in the field of corrosion prevention it is necessary to ensure that the chromate ion is present in the pH 7.5-9.5. Conditions, therefore, call for the use of sodium chromate, which is frequently made by treating the cheaper sodium bichromate with caustic soda, 27 lb. of caustic to every 100 lb. of sodium bichromate being required to attain the proper pH.

Chrome pigments, particularly calcium, strontium, barium and zinc chromates, owe their great value in the manufacture of paint primers to their corrosion-inhibiting properties. These pigments function by virtue of their controlled release of the water soluble chromate, the pigments being soluble to the extent that a small amount of chromate will "bleed" from the pigment when in contact with moisture and the chromate ion will then exhibit its characteristic properties of inhibiting corrosion.

Protective Films

Soluble chromates cause the formation of closely adhering protective oxide films on the surface of metals and so prevent their attack by known corrosive solutions, as in the employment in operating or reserve boilers of a small quantity of soluble chromate in the water to prevent corrosion of the metal. The minimum concentration recommended for idle boilers is about 200 p.p.m. and in the working boilers the concentration should be increased until the blow-off liquor shows about 400 p.p.m. The latter is effective up to a pressure of about 200-250 p.s.i.

Where the chloride content of circulating water is increased through evaporation of the water—the real danger point being about 1000 p.p.m.—the presence of sodium chromate to the extent of 500-1000 p.p.m. in the water will effectively control corrosion.

The inhibiting properties of chromates are utilised quite extensively in this way; for example, the cooling of diesel engines with water containing soluble chromates will prevent the formation of rust and scale. Here the concentration of the chrome salt depends on the type of cooling system in use. If the same cooling water is used for very long periods without changing then a high concentration of chromate, as much as 5000 p.p.m., is required.

Where too small a percentage of chromate is used there is always a danger of serious localised corrosion taking place and it is, therefore, important to determine the optimum quantity needed for each type of application. Too high a concentration of chromate may, on the other hand, also present problems, as it will in gas condensate wells if excessive amounts of chromate are present. It is then likely that deposits of hydrous chromic oxide will be formed in the effluent water.

The use of chromates in air conditioning units derives a special interest from the circumstance that the corrosion problem is aggravated by the common use of dissimilar metals. It is difficult to prescribe an inhibitor which will effectively protect

(continued at foot of next page)

Rising Level of N-F Metal Stocks

STOCKS of the principal non-ferrous metals in June, held by Government and consumers, were larger than in the corresponding month last year. Among the increases (1949 figures in brackets) shown by the British Bureau of Non-ferrous Metal Statistics were blister copper 46,204 long tons (38,787); zinc in concentrates 29,316 (18,841); lead in concentrates 72 (51); imported virgin lead 67,857 (55,614); English refined lead 6262 (4034).

Production increases were noted in slab zinc 6933 (5871); lead in concentrates 241 (198) and English refined lead 6593 (2777), but there were decreases in the output of blister copper 1498 (3280) and refined copper 15,558 (16,122).

Imports were also generally higher than they were in 1949 and in May this year.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	43,083	81,208
Imports	13,068	17,691
PRODUCTION:		
Primary	--	9,110
Secondary	1,498*	6,448
CONSUMPTION:		
Primary	9,230	26,827
Secondary ..	-	17,672
Exports	1,049†	26
CLOSING STOCKS:		
Govt. and consumers'	46,204	78,992

* Rough copper.

† Rough copper despatched to Belgium for refining on toll.

OUTPUT OF COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	25,873 long tons
Alloyed copper products	26,320 ,, ,,
Copper sulphate	4,933 ,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	32,855	49,841
Imports	5,327	16,768
PRODUCTION:		
Virgin and remelted	—	6,933
CONSUMPTION:		
Virgin (incl. debased)	8,866	20,323
Remelted and scrap	—	7,558*
Exports and re-export	- -	10
CLOSING STOCKS:		
Govt. and consumers'	29,316	52,722

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc., which is also included as consumption of concentrates.

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...		60,169	5,154	-
Other stocks ..	90	—	—	.
IMPORTS . . .		22,762	—	653
PRODUCTION	241	—	6,593	
CONSUMPTION ...	259	14,300	5,485	7,592
EXPORTS		3		- -
CLOSING STOCKS:				
Govt. and consumers' ...		67,857	6,262	—
Other Stocks ...	72	—	—	—

CHROMATE PROTECTION FOR METALS

(continued from previous page)

several different metals, such as steel, copper, aluminium and zinc. Chromates are fortunately able to inhibit corrosion, provided optimum quantities are used. Here again the percentage used must depend on several factors, such as the extent of the rust and scale in the system; temperature of the circulating water; pH; concentration of all dissolved corrosive salts and also the nature of gases and vapours present in the air as it is drawn into the air conditioning unit. A fairly common practice is to have an initial concentration of 500 p.p.m., sufficient to effect an immediate cleansing of the system, and to reduce this to about 100 to 300 p.p.m. as a working strength.

In the U.S.A. chromates are utilised in oil well drilling to control the corrosion of drilling tools subject to corrosion fatigue. The Diamond Alkali Company, Ohio, which has carried out a great deal of development work on the use of chromates as corrosion inhibitors recommends the addition of chromates to the drilling mud. By this means it is said that the frequency of drill string failure can be reduced by 50 per cent or more, and the mud handling equipment will also benefit from the corrosion protection.

OVERSEAS CHEMISTRY AND INDUSTRY

WIDER HORIZONS IN GERMANY

More Oil, Chemicals and Synthetic Fibres

GERMAN coal-oil and hydrogenation interests are continuing their efforts to secure further relaxation of Allied restrictions of production. Negotiations are in progress, the intention of which is to secure the resumption of operations in the Scholven hydrogenation plant. Scholven-Chemie AG, Gelsenkirchen-Baur, hopes to obtain a permit for a monthly throughput of 15,000 tons of residual mineral oils. The hydrogenation industry is also pressing for preferential treatment in taxation matters on the ground that it can provide larger quantities of motor fuels from imported crude oil than the refineries can and is capable of utilising coal-tar products of which increasing stocks are being accumulated.

The OEEC Mineral Oils Committee has given its consent to German proposals for the erection of new cracking plant with a total capacity of 1.1 million tons annually, in addition to the existing capacity of about 500,000 tons and the Esso installation of 400,000 tons annually which is to be built at Harburg. Work has now begun on the erection of a new 600,000 ton oil refinery at Lingen, Emsland, which is exclusively to treat crude from the Emsland oilfields. These are now supplying approximately half the total West German crude petroleum output which in the first half of 1950 amounted to 525,000 tons, compared with 380,000 tons in the corresponding period of the preceding year.

Recovery of Individual Firms

Recent shareholders' meetings of leading West German chemical firms have furnished an interesting commentary on the rapid recovery of individual industries. Elektrochemische Werke München AG, which last year partly rebuilt its hydrogen peroxide plant at a cost of about Dm. 3 million, reports a further improvement in production and sales and resumption of old contacts for persulphates with Greece, Italy, France, Britain and Switzerland. It is expected to reach 50 per cent of the former capacity by next Spring. Sachtleben AG für Bergbau und Chemische Industrie, Cologne, has regained the pre-war level of lithopone production and almost reached the 1938 export volume; exports last year already accounted for half the total sales.

Casella, Fechenheim-Main, is approaching the pre-war level of production. Exports here account for more than one-third of the total sales. The company has started the manufacture of a number of new intermediates, dyes, pharmaceuticals and specialities for the textile industry; these now constitute a third of the total production. AG für Chemische Industrie, Gelsenkirchen-Schalke, which produces lithopone, sodium sulphate and carbon disulphide, is operating its factory at 75 per cent of pre-war capacity and views the prospects with confidence. Süd-Chemie AG, Munich, has carried out important extensions and reports that substantial export gains are largely responsible for the favourable situation.

Artificial Fibre Factories

Perlon fibre is now being produced in all four occupation zones—at Schwarza (Thuringia) in the Russian zone, at Uerdingen (North Rhine-Westphalia) in the British zone, at Bobingen (Bavaria) in the U.S. zone and at Freiburg (South Baden) in the French zone. The three West German plants intend to extend operations considerably before the end of this year, and another factory, the Farbenfabriken Bayer works at Dormagen, is to enter the Perlon field shortly. Kunstsiedefabrik Bobingen AG, which hopes to double its Perlon production—now stated to be 30 tons a month—in August, is negotiating with AG für Plastikindustrie, Romanshorn, Switzerland, about a long-term contract under which definite quantities of Bobina-Perlon are to be supplied to the Swiss firm for five years in return for a Dm. 7 million loan for extension of the Bobingen works.

The works at Dormagen have made considerable progress in overcoming damage due to neglect of repair work during the war. Special-purpose fibres made at Dormagen include Crinex, a cellulose fibre for upholstery, Dorix cellulose-basis bristles, Dorlon bristles, a fully synthetic product, Dralon for fishing tackle, and PeCe-U bristles. The West German production of rayon and rayon staple continued to increase this year and in the first six months of 1950 rayon amounted to 24,393 metric tons (first half of 1949 23,673) and staple fibre to 56,145 metric tons.

SODIUM CHEMICALS FOR INDIA

Current Proposals to Forward Industrialisation

CHEMICAL and allied industries are bound to play a rôle of increasing importance in India's project to become self-supporting in respect of many products now imported. Salt, as the primary source of most sodium-containing substances and of chlorine and hydrogen chloride, is therefore of vital importance in the country's industrial development.

Self-sufficiency in the salt industry is anticipated by 1951 (THE CHEMICAL AGE, 63, 162), and publication of a booklet "India and the Salt Industry," by Sri E. B. Tisseverasinghee, B.Sc.(London)* affords a useful review of the problems which have to be considered.

Three Million Tons a Year

There is practically no industry, the author points out, that does not call for the use of sodium salts at some stage, while the chlorine products, at one time largely neglected, are becoming more and more in demand.

There is scarcely any foreseeable limit to the industrial uses of common salt. He cites the fact that the U.S.A. uses approximately 170 lb. of common salt per head per annum for industrial purposes. On the same basis, India would require over 25 million tons of salt yearly. The author admits that is not likely to be even approached within the lifetime of any of the present generation.

Yet any industrialisation at all would call for large quantities of common salt, and it would be unwise if India were to provide for a productive potential of less than about 3 million tons of common salt for industry within the next 10 or 15 years. It would be most dangerous for an Indian chemical industry to develop without assuring itself of an adequate indigenous production of common salt.

One of the first problems is, of course, to determine where salt could be produced most economically.

Industrial salt is dependent to a far greater extent on proximity to sources of cheap fuel and power, and to users of the products. Bombay and Calcutta, Mr. Tisseverasinghee points out, are obvious places where cheap salt is urgently required. Not quite so obvious are the fish-curing areas. Proximity of limestone, clay, gypsum, etc., also has its own influence on such advice.

He considers it is practicable to site a new salt factory where natural conditions prove favourable, and thereafter to shift plant whenever a sufficient large-scale or profitable demand is made by any industry.

To meet industrial demands cheap production from new sources in the south or east are essential. If a suitable area can be found half the problem will be solved.

In India salt production should be almost exclusively by solar evaporation up to at least the point where saturated salt brine is produced. Beyond that point in the initial stage of a new industry, the processes must be entirely solar evaporation, with collection of salt by manual means. But provision would have to be made to manufacture a limited quantity of salt by a boiling process.

If this could be done cheaply, there would be an immediate market for the whole output. Even if it was costly, it would still be saleable in smaller quantities. The whole question is based on the economics of fuel and power.

The author considers it safe to predict that much of the salt will eventually be produced by boiling down saturated brine, produced by solar evaporation.

Sea Water Salterns

For solar evaporation the structures required are mainly earthworks. Since total requirements, both domestic and export, may eventually absorb five million tons, it would not be unreasonable to enclose an area on an equivalent scale.

Such pans would be fully economic even if only one-tenth of the full capacity was employed at first. The sea water which would be employed contains a number of other salts from which gypsum, magnesia and potassium chloride can be obtained.

The fertiliser project at Sindhri requires about 3-400,000 tons of gypsum annually which at present it is proposed to bring by rail from Rajputana, over 1000 miles away, or from overseas. Similarly the proposed new steel factories for Bihar and Assam would require large quantities of refractory quality magnesia which could be profitably supplied from the saltern enterprise.

* In 1944 Sri E. B Tisseverasinghee was given charge of the Ceylon Salt Department Since then he has made a special study of salt and the related industries. He has visited most of the salt-producing centres in North and South India and published a Treatise on the future potentialities of the salt industry (Ceylon Sessional Paper No B 1948).

Potash is also inadequate in most tropical lands, so that an enterprise such as an integrated salt manufacturing scheme which would combine three technical processes, would well deserve the support of the Government of India.

Another aspect of India's sodium chemical requirements, caustic soda, has been ably reviewed by S. G. Sastry in the *Journal of Scientific and Industrial Research* (Vol. 19, No. 6).

He estimates the present demand for caustic soda in India to be 70,000 tons a year, while the production in the country is not more than 10,000 tons a year. The balance of 60,000 tons is obtained by imports mainly from England and, more recently, from America, Belgium and other countries.

From the national point of view, he urges, it is imperative that this industry should be expanded, and every encouragement given to those who have started manufacturing this key chemical.

Costly Production

Generally speaking, the author points out, the cost of producing caustic soda in India is much higher than in other countries. There are several reasons: (a) capital costs in India per unit production are higher than in other countries; (b) scale of operations is small and the proportion of overhead expenses and salaries of technical staff is proportionately high; (c) neither high purity common salt nor high purity lime is available in India; (d) the cost of fuel in India is higher than in other countries; (e) the freight charges on Indian railways are high; and (f) except in Mysore and at Mettur the cost of electric power is high.

The important requirement now was to step up the scale of operations and so bring down the price of the product. It was unfortunate that even in areas where there was a sizeable demand for caustic soda, industrialists did not co-operate in a common endeavour.

In Bombay, for example, there are textile mills, soap factories, vegetable oil refineries and a new rayon factory. The total annual demand of these and a large number of other industries needing caustic soda would require at least 10,000 tons. Yet there was not one large caustic soda factory with this output.

Instead of evaporating the liquor to solid caustic soda involving heavy expenditure on fuel, the caustic soda required by the factories could be supplied as liquor in tank wagons. If the manufacturers would not co-operate, the Government of India should establish a large caustic soda plant within the Bombay area and compel all users of caustic soda and chlorine to take their supplies from it.

It should be possible to have jointly owned caustic soda factories at Ahmedabad, Coimbatore, Bangalore, Calcutta, Kanpur and Delhi. If these co-operative or jointly owned factories came into existence imports of caustic soda might be gradually abandoned.

India is depending mainly on sea salt for her industrial needs and the salt manufactured is unfit for chemical industries. The Government of India should take steps to improve the methods of salt manufacture.

Research in this direction was started under the auspices of the Council of Scientific & Industrial Research, but the problem does not appear to have been pursued to its logical end. The council, says Mr. Sastry, should also explore the possibilities of utilising surplus chlorine in industry.

Italy's Natural Gas

FAVOURABLE results are reported to have been achieved in the exploitation and distribution of Italy's considerable natural gas resources, although less success appears to have attended the efforts to locate commercial quantities of oil. An increasing output of natural gas is announced by the State-owned Ente Nazionale Metano, the amount for 1949 (in million cubic metres) being 247.33, against 135.81 in 1948, 98.68 in 1947, and 27.77 in 1940.

Industrial and domestic users in 1949 consumed 145.99 million cu. m., an increase of more than 100 million over 1948. An idea of the extent of the development of these natural gas resources in the last decade is gained from comparison with the consumption by the same group of consumers in 1940, which was only 2.32 million cu. m.

Natural gas used in Italy last year as motor fuel amounted to 68.09 million cu. m., compared with 58.07 in 1948, 54.76 in 1947, and 16.74 in 1940. The Italian Ministry for Industry indicates that output in the first few months of this year fluctuated between 1.2 and 1.3 million cu. m. per day.

Experts are confident of further increases in the output from many of the natural gas occurrences in Italy. A five-year plan by the Ente Nazionale Metano provides for 21 new test drillings as well as for the further development of some 38 previously located sites. Drilling equipment, the lack of which is said to be holding back operations, is to be acquired with the aid of ERP funds.

Technical Publications

THE tendency to employ higher temperatures and higher steam pressures in power plant operation has created problems for feed pump designers striving to meet requirements for both normal and emergency conditions. One of the main problems is due to the rapid expansion of the component parts of the pump assembly which may cause distortion and move the bearings out of alignment. To meet this problem a new feed pump has been designed by the Harland Engineering Co., Ltd., and is described in the current issue of "Wiggin Nickel Alloys" (Henry Wiggin & Co., Ltd., Birmingham). The pump has only one high pressure joint between the casing and the massive steel end cover, and for this a cupro-nickel corrugated joint ring is employed. The ring is clamped between two flat plates of forged steel and is said to give a greater margin of safety in respect of temperature fluctuations than the plain metal-to-metal joint. The use of a cupro-nickel ring also permits a lower bolt tension to be used. Tests have shown that these joints will withstand a steam pressure of 300 p.s.i. at 500° F.

* * *

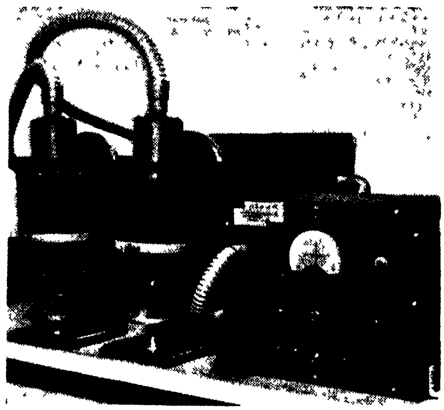
ABSORPTION determination and instruments form the principal features in "The Bulletin and Laboratory Notes" (Series II, No. 16) now available from Baird and Tatlock (London), Ltd. A description is given of the BTL self-balancing photoelectric absorptiometer designed to record the composition of any liquid whose absorption can be related to some form of chemical analysis or turbidity. The instrument was produced in collaboration with I.C.I., Ltd., which was responsible for the fundamental design and much of the development. Other articles include a description of the completely redesigned Spekker absorptiometer and a study of the determination of soil moisture control values by the gypsum absorption cell.

* * *

NATURAL rubber is the subject of a comprehensive survey issued as a supplement by the *Financial Times* this week. The chemical problems of ageing are discussed by Dr. Geoffrey Gee and other articles deal with extending applications of rubber, post-war growth of the industry in the U.K., the progress and promise of latex foam and the need for research.

* * *

THEORETICAL considerations in the operation of iron blast furnaces with cold oxygen carbon-dioxide blast are discussed



[By courtesy of Isotope Developments Ltd

The first British non-contact beta gauge incorporating radioactive isotopes to measure weight per unit area of sundry materials in sheet form (THE CHEMICAL AGE, 62, 920). *Tracer material, such as* P^{32}, *in the two ionisation chambers provides the beta radiation by which it is already possible to measure thickness in the range 1-150 mgm/sq. cm. Stronger source of radiation may increase the range to 1 gm/sq. cm.*

by William Bleloch, Ph.D.(London), F.R.I.C., M.I.Chem.E., in the *Journal of the Chemical Metallurgical and Mining Society of South Africa* (Vol. 50, No. 11).

* * *

IMPACT is the title of a new quarterly bulletin, published by UNESCO, of which the first issue is now available. The object, according to the foreword, is the collection of information on the various aspects of the international and social implications of science and to present the material in the form of readily available abstracts.

* * *

THE comparative novelty of high vacuum technique in general industrial and laboratory use is called to mind in a digest published in booklet form by W. Edwards & Co. (London), Ltd. This provides an index of available equipment and components and serves as an introductory manual for studying new products.

* * *

NEW and used handling equipment and prime movers with a wide range of applications are described in "Plant" (Vol. 2, No. 5) obtainable from Chamberlain Industries, Ltd., Leyton, E.10.

The Chemist's Bookshelf

STREPTOMYCIN. Edited by S. A. Waksman. 1949, London. Baillière, Tindall & Cox. Pp. ix + 618. 76s. 6d.

This book is of prime importance to workers in antibiotics and tuberculostats. Edited by Waksman, the discoverer of streptomycin, there are 46 chapters arranged in four sections. The 58 contributors' connections range from the academic to the industrial. In recent years the Americans have achieved great success in securing the collaboration of workers with academic, medical and industrial backgrounds in the attack on common problems. This has been most notable in the production of penicillin by the submerged mycelium fermentation and in the all-American discovery and production of streptomycin.

The book claims to summarise the present status of the subject. There are, however, formidable difficulties in producing a book of this character by so many specialists; overlapping is inevitable. It is not reasonable to expect continuity of narrative and the volume must be tested on its merits as a symposium. On this basis the volume is most successful, both in detail and comprehensiveness.

The four sections of the book are as follows: (1) Microbiological and chemical aspects; (2) Antibacterial and pharmacological properties of streptomycin; (3) Clinical use of streptomycin; (4) Miscellaneous uses of streptomycin. Readers will find the main interest in the first two sections. The book is, perhaps, somewhat uneven in that only 12 per cent of the pages are concerned with Section 1 and 27 per cent with Section 2. This tends to emphasise the medical aspects.

Chapters 1 and 2 are devoted to a historical introduction and to a discussion by the editor of the nature and nutrition of *Streptomyces griseus*, written in his usual lucid style and from his own specialist approach. Chapter 4 deals with the production and isolation of streptomycin. The author is quick to warn (p. 33) that the reader will find none of "the significant details of the existing industrial processes." This is not surprising, but it makes the book less valuable to the chemical engineer. We are assured, however, that the basic steps "remain essentially unchanged."

The chapter does, however, indicate the approach to the problems involved. A special instance is the concentration by adsorption, which contrasts with the solvent extraction techniques used in penicillin manufacture.

There is a basic paper by R. L. Peck *et al.* on the technique of adsorption on columns of adsorbent material but whether the technique has been successfully applied in practice is left open to doubt. What is already known about methods of purification by precipitation (*e.g.*, through the reineckate) and by crystallisation as a so-called double salt (*e.g.*, with calcium chloride) is summarised. The author does concede, however, that purification through the calcium-chloride complex is being carried out on an industrial scale.

Dihydrostreptomycin, isolated during important attempts to elucidate the structure of streptomycin, is important because, compared with streptomycin, the onset of vestibular dysfunction is delayed. It has been used quite widely. Tishler discloses that the catalytic hydrogenation of streptomycin has been adapted to large-scale production but does not describe the character of the adaptation. A further chapter gives details of bacteriological and chemical methods of assay. The presentation is not critical.

Streptomycin therapy is complicated not only by streptomycin resistance but also by actual dependence. Miller, who has specialised in this subject, jointly contributes chapter 10 on the complicated problems in biology and genetics arising from these causes. The authors critically examine present theories and the wider implications of the phenomenon. Other chapters in section 2, of particular interest to the biologist and pharmacist reader, on the antibacterial and pharmacologic properties of streptomycin, deal with the mode of action of streptomycin; synergisms in which streptomycin may be involved; absorption and excretion of the antibiotic; and finally, a chapter on the pharmacology proper. Section 2 is, on

the whole, much more adequately treated than Section 1.

Sections 3 and 4 will be of less interest, though a layman, on the fringe of the medical and veterinary aspects of the topic, might consider them of value.

The book is well bound and beautifully printed on excellent paper. References at the end of each chapter are adequate. The subject index is sufficient. Tables and chemical formulæ are clearly presented. There are 95 figures including graphs and photomicrographs; these are, however, not listed.—G.C.G.

PHENOLIC RESINS—THEIR CHEMISTRY AND TECHNOLOGY. P. Robitschek and A. Lewin. 1950. London: Iliffe & Sons, Ltd.; 30s.

This is a useful book for the student preparing for the new API examination who wants to know all about first principles rather than manufacturing details. In 261 pages the authors have covered their subject in a broad informative manner and this treatment, acceptable to the student, leaves something to be desired by the chemist and technologist. It is disappointing to find only 13 pages in Chapter 6 devoted to the actual production of phenolic resins and out of this total some three pages are spent on the "Laboratory Preparation". The plastics industry today is keenly interested in continuous methods of resin manufacture, and this the authors dismiss in a few lines. As this book claims to deal with new trends as well as established methods, this omission is a serious one. There is a lack of information about nitrile rubber modified phenolic resins, which are becoming important where great toughness and a low modulus of elasticity in tension are required. Another disappointment is the paucity of information about new applications of phenolic resins—only three lines are given to phenolic exchange resins. and the same wordage covers the use of phenolic resins in coatings. Chapter 15, dealing with applications, should have been greatly extended.—P.S.

FORTSCHRITTE DER ALKALOIDCHEMIE SEIT 1933. Dr. Hans-G. Boit. 1950, Akademie Verlag Berlin. Pp. xvi + 425. Price 53 Dm.

The book, No. 2 of the series "Scientia Chimica", presents a most comprehensive survey of the progress in 1933-1949 in the field relating to the constitution and synthesis of the alkaloids. It aims at making the reader acquainted with a special subject, the international literature of which has not been adequate since before the war. It can be considered as a sequel to the monographs on alkaloids by R. Seka, E. Winterstein and G. Trier, which dealt with the development of alkaloid chemistry up to 1932.

The book is divided into two parts. The first (pp. 2-340) deals in 25 chapters with alkaloids of which the constitutional formulae and eventual synthesis were established and grouped with the compounds to which they were related. The second part (pp. 341-401) comprises alkaloids of constitution hitherto unknown, divided into the two main groups of cryptogames and phanerogames. The alkaloids are arranged according to their origin or to the heterocyclic ring which they contain, and are represented by graphic formulae as far as those are established. They were usually extracted from plant tissues by lixiviating the finely divided tissue with acidified water, neutralising and filtering the product. The present book demonstrates the value of some new methods.

As the alkaloids form an extremely important group of compounds on account of their physiological properties and are the active principles of the common vegetable drugs, this book should appeal to the chemist as well as to the biologist, pharmacologist, pharmacist and the medical man. The great number of alkaloids dealt with can be judged by the fact that its subject index lists in alphabetical order more than 2000 compounds, apart from a great number of references in footnotes. It throws some light on very recent researches, some, dealt with in an addendum, as late as February this year.—F.N.

Books Recently Received

BORON TRIFLUORIDE AND ITS DERIVATIVES. H. S. Booth and D. R. Martin. 1949, London: Chapman & Hall, Ltd. New York: John Wiley & Sons, Inc. Pp. ix + 315. 40s.

A CONCISE APPLIED PHARMACOLOGY. F. G. Hobart and G. Melton. 1949, London: Leonard Hill, Ltd. Pp. xxviii + 234 + viii. 21s.

PHYSICAL METHODS IN CHEMICAL ANALYSIS. Vol. 1. Edited by Walter G. Berl. 1950, New York: Academic Press Inc. Pp. xiii + 664. $12.00.

PRACTICAL APPLICATIONS OF SPECTRUM ANALYSIS. H. Dingle. 1950, London: Chapman & Hall, Ltd. Pp. ix + 245. Plates XIX. 40s.

CHEMICAL ENGINEERS' HANDBOOK. Edited by J. H. Perry. 1950, New York, London and Toronto: McGraw-Hill Book Co. Inc. Pp. xv + 1942. 144s. 6d.

CHEMICAL INDEX OF MINERALS. M. H. Hey. 1950, London: Published by British Museum. Pp. xx + 609. 30s.

· OVERSEAS ·

No Reduction in Whaling Quota

The International Whaling Commission has decided not to reduce the quota of whales to be caught each season in the Antarctic.

More Du Pont Patents for Licensing

With the addition recently of a further 462 of its U.S. patents to the list available for licensing, E. I. Du Pont de Nemours & Co., has now made available a total of 5400 patents, or about three-quarters of those owned by the company.

Indian Fertiliser Loan Proposed

The Government of Madras is examining a scheme for offering a loan of Rs 25 per acre of cultivable land where ammonium sulphate is applied under their programme of intensified cultivation in specified districts. A subsidy system also continues to operate.

Wages Increase in U.S.A.

A new agreement between Dow Chemical of Canada and the local section of the United Mine Workers of America, which has been ratified by both sides, provides a 10-cents hourly wage increase as from the beginning of this year and improved social security features. At the end of one year wages will be advanced another 5 cents per hour.

Norway to Increase Iron-Ore Output

The Kirkenes iron-ore mines in Northern Norway—the most important in the country—owned by the A. S. Sdvarangar, are being expanded at a cost equivalent to about £9 million. It is expected that annual output will aggregate 500,000 metric tons by the end of next year and about one million metric tons from the beginning of 1952. Norway's iron-ore output last year was 375,000 metric tons.

Fats from Oil-Bearing Seeds

Two subjects discussed at a joint meeting of the Nutrition Advisory Committee of the Indian Council of Medical Research and the Animal Nutrition Committee of the Indian Council of Agriculture, held in Bangalore recently, were the desirability of solvent extraction of fat from oil-bearing seeds and cakes to increase the available supply of oil in India, and the possibilities of the cultivation of soya bean on a large scale. For the purpose of studying the problems involved in the solvent extraction of fats, a sub-committee was formed with Professor B. N. Banerjee, of the Indian Institute of Science, as convener.

Clay Studies in Australia

A modern laboratory for the study and analysis of clays has been established by a company in Melbourne, Australia. The company is engaged in the production of high-class electrical porcelains and radio ceramics, using steatite and zirconium silicates.

Indian Tung Oil?

Tung oil, the ingredient for paints and varnishes, coming principally from China, has been the subject of research at the Forest Research Institute, Dehra Dun, India, and the results are incorporated in a pamphlet just published. Experiments at the institute show that the tung tree has a wide range which renders its propagation in many localities in India possible.

Uranium Deposits in South Australia

Occurrences of uranium found in the Adelaide hills were disclosed by Mr. Playford, the Premier, last week when he announced that the State Government was sending the director of mines, Mr. S. B. Dickinson, to visit the U.S.A., Canada and Great Britain. Mr. Dickinson will study developments in uranium mining so that the commercial value of the South Australian deposits can be assessed and will discuss the exploitation of the uranium field at Radium Hill.

Canadian Nylon Advance

Plans for the construction at Kingston, Ontario, of a plant to manufacture the base material for nylon, hitherto imported from the United States, are announced by Canadian Industries, Ltd. The new plant, adjacent to C.I.L.'s nylon plant, will cost about $500,000 and is expected to operate early in the summer of 1951. Basically it will combine the chemical solutions used to make nylon and its entire output will be used for the manufacture of yarn and staple fibre in the C.I.L. plant.

Promising Results With French Pitchblende

Results of work at the pitchblende mine at La Crouzille (Haute Vienne) are reported by Professor Roubault, director of research at the Atomic Power Commissariat, to have been very satisfactory. The main characteristic of this seam is that the pitchblende is visible and can be sorted on the spot instead of being brushed, washed and sorted like the radioactive ore at Puy-de-Dome. Other soundings are being made over a 15 to 20 hectare area and some have reached a depth of 350 metres.

PERSONAL

POWER Jets (Research and Development), Ltd., announces that it has secured the collaboration, as consulting engineer, of MR. GEORGE JENDRASSIK, international authority on gas turbine and diesel engines. Mr. Jendrassik, who was born in Hungary, began work on gas turbine engines in 1935 and, just before the war, produced the world's first workable small gas turbine engine. It developed 100 h.p. He is a member of the Institution of Mechanical Engineers and has been on the board of Metropolitan Railcars, Ltd., since 1948.

Three Wellcome Pharmaceutical Research Fellowships of £350 each for one year have been awarded by the adjudicating committee of the Pharmaceutical Society to MISS M. DAWSON, Airdrie; MR. J. R. HODGES, Eastcote; and MR. G. P. LEWIS, Cardiff. Miss Dawson will do research work at the School of Pharmacy, Royal Technical College, Glasgow, of which she is one of the staff, on the properties of pyrogenic substances; Mr. Hodges at the School of Pharmacy, University of London, in pharmacology; and Mr. Lewis at the Welsh National School of Medicine, into the properties of a group of newly synthesised anti-histamine compounds.

Long service awards of clocks and wristlet and pocket watches have just been made to 109 employees at the Castner-Kellner works, Weston Point, Widnes, of I.C.I., Ltd. The presentations were made by MR. F. HOLT, technical managing director of the general chemicals division. Fifty-six of the recipients have completed 20 years and one, MR. J. WHITTLE, who is to retire this year, 51 years. Awards for long service have also been made at the I.C.I. Randle Works, Runcorn, to MR. R. P. LITTLER and MR. P. WOODWARD, each with 40 years' service, and MR. G. PALMER and MISS MARSH, each with 20 years' service.

A gold watch has been presented to MR. F. HANDFORD, manager of the Newcastle and Middlesbrough shipping offices of I.C.I., Ltd., in recognition of his service with the firm during more than 30 years.

MR. ALFRED WATTS, Collier Row, Romford, Essex, has completed 50 years' service with Howards & Sons, Ltd., the Ilford chemical manufacturers.

MR. H. YEOMAN, sales manager of the Clayton Aniline Co., Ltd., Manchester, has been appointed commercial manager, and MR. G. H. CARNALL deputy commercial manager. Mr. Carnall was formerly assistant secretary of the company.

MR. LEWIS G. WHYTE has resigned from the board of Petrochemicals, Ltd.

OBITUARY

The death has occurred, at the age of 69, of MR. E. T. NEATHERCOAT, chairman and managing director of Savory & Moore, Ltd., and associated companies and formerly president of the Pharmaceutical Society of Great Britain. He became a student at Bloomsbury Square in 1900 and won the Society's silver medal for pharmacy and the bronze medal for practical chemistry in 1901/1902. He was elected to the society's council in 1909, only seven years after qualifying as a pharmaceutical chemist; he was on the council continuously for 30 years. He was vice-president from 1914-1919 and president from 1920-1924. Mr. Neathercoat was also a past chairman of the Pharmacy Board of Examiners, and it was during his term as president of the society—specifically in 1922—that the branch organisation as at present known was started. He was one of the three pharmacists who served on the departmental committee on the Pharmacy and Poisons Act and was also a member of the Poisons Board and of the society's statutory committee.

The British Coal Research Association has announced with deep regret the death, on July 29, of DR. D. H. BANGHAM, director of its research laboratories. He had been in failing health for some time. A note from the association recalls that Dr. Bangham was a fine scientist and a loyal colleague wholeheartedly devoted to his work and the interests of the association.

The death has taken place of CAPT. A. D. R. ALDRED, managing director of Shirley Aldred and Co., Ltd., wood distillers, Oakwood Chemical Works, Worksop, Notts. He had been associated with the firm since 1906, and during the first world war he took a leading part in the country's production of acetones. He was chairman and secretary of the National Association of Charcoal Manufacturers.

HOME

One Per Cent Tolerance for Mineral Oil

The Ministry of Food has amended the Mineral Oil in Food Order, 1949, to permit the use of prunes, currants, sultanas and raisins containing not more than 1 per cent of mineral oil and of foods in which such fruit forms a part.

Derationing of Soap

Following the announcement that soap rationing will end on September 10, a general licence under the Soap (Licensing of Manufacturers and Rationing) Order, 1950, has been issued by the Minister of Food. This will enable wholesalers and retailers to obtain additional quantities of soap, without the surrender of ration documents, so that stocks may be built up to meet the anticipated demands when rationing ends.

Glass Industrial Plant at Helsinki

Industrial plant in glass will be displayed by Quickfit and Quartz, Ltd., at the 7th Scandinavian Chemists's Congress, to be held at Helsinki from August 21-25 inclusive. The congress, which is expected to be attended by leading experts in the chemical industries from Denmark, Norway, Sweden and Finland, is to be addressed on the subject of glass chemical plant by Mr. B. H. Turpin, director and manager of the London company.

Criticism of Alkali Works

Chemicals dispersed by the wind from the I.C.I. works at Northwich were harming trees, shrubs and grass in Verdin Park, Mr. T. Garwood (Parks Superintendent) told Northwich Urban Council Parks Committee on July 25. They adopted his report. The laundry of people in Winnington was also affected, said Councillor Mrs. E. Bowden. Councillor W. H. Young doubted the accuracy of the complaint, saying shrubs and flowers at the I.C.I. works were healthy.

Additions to the Poisons List

The Home Office has announced changes in the Poisons List which come into operation on September 1. Among a substantial list of substances added under the first schedule are certain anti-histamine substances and their salts. These now come under Group 2 of the schedule and are exempted from the provisions of the Pharmacy and Poisons Act when in the form of preparations for external application only.

Dearer Glycerin

The price of glycerin (in large tonnage lots) was raised on August 1 by £40 a ton, to £165 6s. a ton. This is the highest figure ever reached in Britain for glycerin, and was to bring the home price more in line with that of manufacturers abroad. The former peak price in the U.K. was £140 a ton reached in 1920. It is not expected that the end of soap rationing will affect available supplies of glycerin.

Unrestricted Imports

The following are among the items which, from August 1, have been added to the list of goods which may be freely imported from the " permitted " countries on the usual list to which the policy for the liberalisation of trade is applied: Tea seed oil; compressed gases; painters' materials, specifically distempers (whether dry or not), dry earth colours, pigments and extenders (whether dry or with oil or with other medium, including metallic powders—except aluminium powder—but not including lithopone; tin oxide).

Doctors Visit Research Establishment

On July 20 a large party of doctors attending the British Medical Association conference at Liverpool, went to the Evans Biological Institute at Runcorn, where a scientific conversazione was held. A number of doctors also visited the Speke headquarters of the company during the week. The Evans Biological Institute is engaged in research on sera and the preparation and standardisation of sera and vaccines, liver extracts, heparin, hyaluronidase, cytochrome C and other biological products.

High Exports to North America

The provisional value of United Kingdom exports in June to the United States was £8.0 million and to Canada £9.3 million. In terms of United States dollars these totals were $22.4 million and $26.0 million respectively, compared with $23.0 million and $34.7 million in May and $15.6 million and $25.0 million in April. The dollar value of exports to the U.S.A. and Canada together for the second quarter of 1950 thus represented a monthly rate of $48.9 million, compared with $42.8 million in the previous quarter. It was the highest quarterly dollar equivalent for exports to North America, except that for the fourth quarter of 1948.

The Stock and Chemical Markets

RECENT business remained restricted and price movements were slightly against holders in most sections, sentiment reflecting fears that rearmament connotes higher taxation. Only steel and rearmament shares have shown gains in prices on balance for the week.

Imperial Chemical remained fairly steady at 40s. 7½d. Lever & Unilever eased to 38s. 6d. although no reference was made at the meeting to new capital requirements. The City belief remains that before long more money will be required, particularly as the imminent end of soap rationing means that increased stocks of materials will have to be financed. Laporte Chemicals 5s. units were 10s. 3d., Boake Roberts strengthened to 28s. on the excellent financial results and Albright & Wilson were firm at 29s. 6d. awaiting news of the company's new issue plans. Amber Chemical were 3s., F. W. Berk 2s. 6d. shares 10s. 3d., Bowman Chemical 5s. 3d., Brotherton 10s., Monsanto 48s. 9d., and W. J. Bush ordinary were 79s. 4½d. Burt Boulton & Haywood have changed hands at 26s. 1½d. British Glues & Chemicals 4s. shares have held their rise to 23s. on the excellent results and share bonus proposals. Lawes Chemical were quoted at 10s. 3d. and Cellon changed hands at 18s. Fisons were steady at 25s. 6d. and Borax Consolidated kept at 54s. 6d., but plastic companies' shares again tended to fluctuate, with De La Rue around 22s. 9d., British Xylonite 72s. 6d., Erinoid 5s. shares 8s. 9d., and British Industrial Plastics 2s. shares 5s. 6d. The 4s. units of the Distillers Co. remained active around 18s. on further consideration of the past year's results and 20 per cent dividend. Griffiths Hughes strengthened to 21s. 10½d. on the full results and chairman's annual statement and Boots Drug were firm at 47s. 3d. Turner & Newall receded to 79s. 6d. and United Molasses at 41s. 9d. were uncertain, but United Glass Bottle kept at 75s. Triplex Glass at 21s. 9d. tended to ease on the view now prevalent that it is doubtful whether the dividend will be increased at this stage, and is more likely again to be limited to 15 per cent.

Iron and steels have been prominent with other companies which should benefit from rearmament work. United Steel moved up to 28s., Dorman Long to 31s., Hadfields to 28s. 3d., South Durhams to 31s. 9d., Colvilles to 35s. 6d., and John Summers to 30s. 9d. Guest Keen were 45s. 10½d., Ruston & Hornsby 30s. 3d. and Staveley steady at 78s. 6d.

Glaxo Laboratories were 46s. 4½d., Sangers 22s., Beechams deferred 12s. 9d., Associated Cement came back to 83s. 3d., British Plaster Board 5s. units to 14s. 7½d. and Wall Paper Manufacturers deferred to 48s. 3d. Oils have been uncertain, although they were inclined to strengthen after an earlier further small decline. Anglo-Iranian were slightly under £5⅝, Shell 62s. 6d., Burmah Oil 55s. 7½d. and Trinidad Leaseholds 5s. shares 23s. 6d.

Market Reports

THE approach of the holiday season has had its influence on the markets and spot transactions have been rather less in volume. Interest in new contract business, on the other hand, has been fully maintained and the volume of inquiry for home and export account appears greater than usual. The price position is generally firm, apart from the changes recorded for glycerin, now 168s. dearer per cwt. for 1 ton lots, and for antimony oxide, which has been reduced by £7 10s. per ton. Caustic soda and soda ash are in active request and there is a ready outlet for sodium sulphide and sodium bicarbonate. Offers of the potash chemicals are quickly absorbed and other items in good call include formaldehyde, hydrogen peroxide and the barium compounds. A steady trade is reported for most of the coal tar products and xylol is firm on a good demand.

MANCHESTER.—Traders in heavy chemicals again report some interference with new business as a result of holiday stoppages and with the movement of supplies against existing orders. However, trade as a whole is about up to the level of previous years. A moderate amount of overseas business is reported. Prices generally are on a strong basis. Trade in fertilisers has been fairly satisfactory, although seasonally rather quiet. Light tar products continue to meet a steady demand.

GLASGOW.—Renewed activity has been evident in the Scottish heavy chemical market. The export market has also shown signs of revival. There is a distinct tendency throughout for prices to harden.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DEMA GLASS, LTD. (formerly DEMA SUPPLIES, LTD., London, N.W. (M., 5/8/50.) July 3, £16,000 first mort., to Scottish Temperance & General Assce. Co., Ltd. & £5250 second mort., to Wimbledon Laundry, Ltd.; charged on land & buildings, Cranbrook Road, Wimbledon. *—. Jan. 13, 1949.

NORTH BRITISH ALUMINIUM CO., LTD., Lonon, E.C. (M., 5/8/50.) June 26, disposition granted in implement of a trust deed dated July 30, 1947, & supplemental deed dated Nov. 10, 1948, securing deb. stock of British Aluminium Co., Ltd.; charged on specified portions of the lands of Glen Nevis, Kilmallie. *—. May 16, 1950.

RAINBOW FIREWORK CO., LTD., London, W. (M., 5/8/50.) June 30, £2500 debs.; general charge.

TRENT VALLEY GLASSWORKS, LTD., London, W.C. (M., 5/8/50.) June 30, deb., to Martins Bank, Ltd. securing all moneys due or to become due to the bank; general charge. *—. Oct. 19, 1949.

Receivership

JOHN TYE & SON, LTD., manufacturing chemists, etc., 457 Caledonian Road, N.7. (R., 5/8/50). Mr. Geo. Hay, 50 Pall Mall, S.W.1, was appointed receiver on July 18, 1950, under powers contained in debenture dated July 24, 1947.

Company News

Benn Brothers, Ltd.

The directors of Benn Brothers, Ltd., recommend the payment of the following final dividends, less tax, for the year ended June 30, 1950: 3 per cent on preference shares, making 6 per cent for the year; 20 per cent on ordinary shares (25 per cent for the year—same); 5s. per share on the deferred shares (same).

Canadian Group's Loss

The annual report of the Canadian group, Commercial Alcohols, Ltd., and its subsidiary, Eastern Distillers, Ltd., shows net loss of $300,630 for the year ended March 31, 1950. There was a net loss of $121,904 in the preceding year. A profit and loss deficit of $204,421 is carried forward, against a surplus of $96,208 at the close of preceding year. The report, signed by C. G. Kertland, president, states that of the net loss a write-down of the value of inventories accounted for approximately $200,000. Mr. Kertland states that the net loss reflects low alcohol production at Gatineau, Quebec, low prices for certain industrial grades of alcohol and generally unsatisfactory conditions under which operations were carried on.

New Registrations

Arborn Chemical Laboratories, Ltd.

Private company. (484,777). Capital £1000. Manufacturers, processors and distributors of chemicals and chemical compounds, etc. Directors: A. B. Armitage, A. J. Osborn, N. B. W. Cooper and F. D. Mills. Reg. office: High Holborn House, 52/4 High Holborn, W.C.1.

Lurie Laboratories, Ltd.

Private company. (484,811). Capital £500. To acquire from David Lurie, of Paris, and utilise his inventions relating to the production and treatment of fireproof materials, etc. Directors: D. Lurie, 65 Rue de Lagney, Paris, 20; Jindrich Ost, 981 Finchley Road, N.W.11.

Increases of Capital

The following increases in registered capital have been announced: Croda, Ltd., from £25,000 to £40,000; Jensen & Nicholson from £700,000 to £900,000; Ciba Laboratories, Ltd., from £150,000 to £380,000; Grindley & Co., Ltd., from £40,000 to £55,000; Laboratories for Applied Biology, Ltd., from £1500 to £5500; Union Oxide & Chemical Co., Ltd., from £20,000 to £30,000; Airfoam Fire Protection, Ltd., from £11,100 to £50,100; Tretol, Ltd., from £10,000 to £20,000.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Refining of metals and alloys.—J. Miles & Partners (London), Ltd., J. Miles, G. L. Thomas, and A. G. E. Robiette. Aug. 23 1946. 642,084.

Method of removing carbon from steel.—Chromium Mining & Smelting Corporation. May 21 1946. 642,086.

Process for preparing pure crystalline salts of penicillin, and the pure crystalline salts of penicillin resulting therefrom.—Commercial Solvents Corporation. Aug. 23 1946. 642,369.

Process for the production of substituted diphenylamine 2-monocarboxylic acids.—Ward, Blenkinsop & Co., Ltd., A. A. Goldberg, and H. S. Turner. Aug. 22 1947. 642,091.

Manufacture of therapeutically active sulphur compounds.—Ward, Blenkinsop & Co., Ltd., A. A. Goldberg, and H. S. Turner. Aug. 22 1947. 642,092.

Method of facilitating chemical processes by means of electrical discharges.—J. E. Nyrop. Nov. 12 1946. 642,335.

Fibre board and the like containing resins.—W. W. Triggs. Nov. 12 1946. 642,245.

Process for the treatment of solid particles in fluidised condition.—J. C. Arnold. (Standard Oil Development Co.). Feb. 28 1947. 642,115.

Mothproofing preparations.—Merck & Co., Inc. March 7 1947. 642,248.

Antibiotic substances.—E. R. Squibb & Sons. April 2 1947. 642,249.

Absorption media for carbon monoxide and the treatment of gases containing carbon monoxide.—Sulzer Frères Soc. Anon. June 10 1947. 642,318.

Methods of decomposition of waste sulphuric acid to sulphur dioxide.—United Chemical & Metallurgical Works, National Corporation. June 25 1947. 642,128.

Manufacture of quinazoline derivatives.—Ciba, Ltd. July 2 1947. 642,129.

Preparation of quinazolones.—General Aniline & Film Corporation. July 28 1947. 642,134.

Reaction of vinyl ethers with thiols.—General Aniline & Film Corporation. Aug. 8 1947. 642,258.

Catalytic cracking of heavy hydrocarbons.—Anglo-Iranian Oil Co., Ltd., and G. I. Jenkins. July 23 1948. 642,325.

Production of organo-silicon compounds.—Monsanto Chemical Co. Aug. 14 1947. 642,139.

Methods of preparing resinous compositions from cyclo-pentadiene and liquid coating compositions containing same.—Velsicol Corporation. Oct. 10 1947. 642,331.

Apparatus for assessing the amount of a gas of relatively high magnetic susceptibility contained in a mixture of gases.—G. Kent, Ltd., and R. S. Medlock. Oct. 7 1948. 642,156.

Preparation of diphenyl ethers.—Glaxo Laboratories, Ltd. Oct. 5 1948. 642,159.

Moulding compositions containing aminoresins.—Hornflowa, Ltd., F. M. Herzberg, R. Neiger, and W. H. Roscoe. Dec. 12 1947. 642,258.

Process for the manufacture of fertilisers.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny & Cirey. Dec. 29, 1947. 642,177.

Silica-extended tin oxide and method of preparing the same.—Jan. 6 1948. 642,179.

Process for preparing organo-silicon fluorides.—F. J. Sowa. Feb. 4 1948. 642,189.

Process for the manufacture of heterocyclic bases.—Roche Products, Ltd. Feb. 27 1948. 642,346.

Manufacture of pigments.—I.C.I., Ltd., and J. Glassman. Feb. 4 1949. 642,204.

Resinous compositions.—Westinghouse Electric International Co. March 16 1948. 642,350.

Packing materials comprising fluorine-containing polymers.—E. I. Du Pont de Nemours & Co. March 18 1948. 642,269.

Addition compounds of organic amides.—I.C.I., Ltd., S. Coffey, G. W. Driver, D. A. W. Fairweather, and F Irving. March 23 1949. 642,206.

Processes of preparing cycloalkyl ethers of *p*-hydroxybenzoic compounds and the compounds resulting from said processes.—E. Lilly & Co. April 28 1948. 642,357.

Process for the preparation of 2, 5-diacyloxy-2, 5-dihydrofurans.—Kemisk Vaerk Koge A/K. April 29 1948. 642.277.

Pesticidal compositions.—B. F. Goodrich Co. Aug. 22 1946. 642,534.

Stabilised halogenated aromatic compounds and articles including such stabilised compounds.—Monsanto Chemical Co. March 31 1947. 642,406.

Preparation of guanamines.—American Cyanamid Co. May 6 1947. 642,409.

Glass-to-metal seals and alloys therefor.—British Thomson-Houston Co., Ltd., J. E. Stanworth and G. D. Redston. Dec. 9 1948. 642,668.

The
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Synthetic Glycerin

THE economic history of glycerin is on the whole an argument against its large-scale synthesis, and for that reason the $8 million factory set up by the Shell Chemical Corporation near Houston, Texas, has unusual significance.

Glycerin has a great diversity of uses, but it has always been available, often in excess of demand, as a by-product from soap and fatty acid manufacture. As a result it has an exceedingly erratic price record. With a relatively stable production volume of some size, small fluctuations in the scale of demand have led to sharp price variations. For example, glycerin was 29 cents a pound in America in 1937 and by 1938 the price had dropped to 12 cents. This type of change is typical of the glycerin market in the years between the wars. It is believed that potential users as a chemical raw material were deterred by these abrupt and not easily predictable changes. It is certain that research investigations into the synthetic production of glycerin were held back by this factor.

When war needs set up a great additional demand for glycerin the normal supply-demand picture is distorted. Most of us have good reason to be familiar with that phenomenon. In the first world war Germany produced a fair tonnage of glycerin somewhat cumbersomely by carbohydrate fermentation; in the second world war she developed the catalytic hydrogenation of sugar to produce a mixture containing glycerin. Neither of these methods, however, could hope to find an economic place in times of peace.

In America the post-war story of glycerin has not reproduced the fluctuations experienced in 1920-1939. From 1941 to 1947 production rose by 20 per cent, a relatively small increase when compared with expansions in the same period for many other commodities. On the other hand, what was once only a minor use of glycerin has been increasing at a remarkable rate. As a raw material for plastic or synthetic resin manufacture, glycerin is in huge and rising demand. Its use for cellophane, synthetic coatings, and adhesives accounts for more than 35 per cent of the total demand. The many other uses of glycerin have remained fairly steady in volume, although some have risen In 1947 the price of glycerin had reached 40 cents a pound, but in 1949 it fell to 25 cents. This fall may not seem to agree with the picture of growing demand, but it has been attributed to two factors: first, to the lowering of

On Other Pages

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world prices for fats and oils, and second, the introduction of synthetic glycerin.

Even when glycerin was selling at 40 cents a pound in peacetime, it seems doubtful whether a large-scale synthetic process would have been introduced had it not been thought that the demand for glycerin would continue to rise and that the tonnage capable of being produced during soap manufacture was likely to decline. The intense competition in the United States between fatty soaps and modern detergents, a battle in which soap seems to experience a fresh reverse each year, has undoubtedly been an important factor in the development of the synthetic form. It has been suggested, in fact, that the introduction of synthetic glycerin is a piece of strategy in the detergent-soap struggle. The substantial addition to glycerin supplies has led to a fall in price, which in turn raise the overall costs of soap production. The fact that detergents as well as glycerin can be produced from petroleum has not been overlooked.

The manufacture of glycerin from a petroleum starting point is said to have required 20 years of laboratory research and 10 years devoted to pilot-plant investigations. This is probably not a conservative estimate, and during much of the long development period work must have been retarded by the unfavourable economic condi-market. The basic operation is the conversion of propylene—obtained from cracking petroleum—into allyl chloride. The problem is to chlorinate an unsaturated hydrocarbon without disturbing the double-bond.

It was discovered that the required allyl chloride reaction would take place with a yield of 80 to 85 per cent if chlorination was effected at 500-600°C. and in the absence of a catalyst. Some earlier American reports have given a narrower temperature range.

The conversion of allyl chloride into glycerin is relatively simpler. Two methods are possible; the formation of allyl alcohol by hydrolysis, followed by chlorohydrination to the monochlorohydrin and further hydrolysis to glycerin; or the immediate chlorohydrination of allyl chloride to produce the dichlorohydrin of glycerin, again with hydrolysis to glycerin as the last stage. It is believed that the latter and shorter sequence is used at the Texas plant. A dilute solution of glycerin is given. This is purified by evaporation, settlement, and vacuum distillation, yielding an end-product of more than 99 per cent purity. The

(*continued on page* 216)

Notes and Comments

America's Fertilisers

THE hope that both countries would benefit, which was expressed when the British "productivity team" concerned with superphosphate and compound fertilisers embarked for the U.S.A. in October last, seems in the light of the newly issued report on that tour to have been more than a pious aspiration. There are several fundamental differences distinguishing the industries here and in the U.S.A., in addition to the marked advantage which American makers of superphosphate enjoy in the possession of ample supplies of indigenous sulphur for acid manufacture and the less exacting standard of available content of phosphoric acid. It is safe to predict, however, that this report (*summarised on page 217 of this issue*) will be read almost as widely as it is here and that the one or two inconsistencies observed by the British team, such as the apparent neglect to apply the highly developed system of mechanisation to the despatch of the bagged finished products will not be disregarded in America.

Machines and Large Units

THERE was no expectation in October that any fundamental changes in fertiliser practice here could emanate from the productivity team's findings, but a great opportunity will have been wasted if serious effort is not made to adopt boldly some of the American practice based upon the philosophy of "leaving it to the machine." That cannot be done without substantial new investment to provide such aids as the logical simplified layouts and the ample instrumentation and automatic control which sometimes enables one man in America to operate alone a relatively elaborate acid process. The American expedition, incidentally, underlines the productive advantages of the big undertaking over the little one. The evidence is in the proportionate increases in productivity which have been recorded every year since the war. The record in mixed fertiliser plants reads like this: small plants 8½ per cent; medium plants 13 per cent; large plants (more than 35,000 tons a year) 18 per cent. In superphosphate production small plants have actually shown a deterioration (– 11 per cent) compared with increases of up to 16 per cent achieved by the big units.

Oil and Korea

RECOLLECTIONS of the decisive rôle which petroleum played in the sort of warfare with which most of us had a more or less intimate acquaintanceship between 1939-45 has aroused some speculation as to how that factor may influence the relatively highly mechanised combat in Korea. Both sides, it seems likely, must be dependent on supplies from outside, notwithstanding that there are substantial refinery undertakings within the territory dominated by the North Korean forces. There is no oil in north or south, but there is a refinery in both territories, in the north at Gensan near Wonsan on the east coast, having rail connection with Seoul. The bombing and shelling of an enemy refinery to which there have recently been references appears to be the Gensan plant, whose importance is likely to consist in its tankage rather than its capacity as a producer. Prior to 1939 it was thought to be capable of producing some 250,000 tons a year, but in 1946 it was considered obsolete and unserviceable. Of much more practical importance is the refinery at Ulsan on on the east coast, about 50 miles north-east of Pusan, for which the South Koreans had recently allocated nearly the equivalent of U.S.$300,000 for construction, hoping to raise the productive capacity to some 240,000 tons a year. These facts have been called to mind by the *Petroleum Press Service*, which does not overlook the probability that the outcome of the struggle will not be decisively affected

by local petroleum capacities. The North Koreans' most likely bulk source is Manchuria where, in the Fushan district, oil is being produced both from coal and from shale. In the island of Sakhalin, not remote from the North Korean forces and wholly under U.S.S.R. control, is an installation thought to be producing more than 750,000 tons of refined oil yearly.

The New Coalfield

FOREIGN estimates of the capacity of British chemical industries seldom omit to note the senescence and prospect of dwindling returns from United Kingdom coalfields. How unreliable is the conventional view about coalfields and yields has now been emphasised again by news of a "strike"—fortunately in the geological connotation of the term—about a mile south-east of Rugeley. It points to the existence of possibly 200 million tons of high quality coal lying in seams up to 10 ft. in depth at comfortable mining levels. The deepest is said to be about 1800 ft. underground and there are thought to be very substantial reserves much more accessible. This, it will be noted, is not an isolated occurrence; it is in fact anything but the exception proving the rule that Britain's coal reserves are worked out. It appears, on the contrary, to be the fulfilment of what was suspected when the Geological Survey of Great Britain early last year revealed the existence of at least 400 million tons of workable coal around Whittington Heath, near Lichfield, Staffordshire. It would be difficult to overestimate the prospective value of this potential addition of mineral wealth, the source of a diversity of chemicals and of the energy required to process them, which relatively few neighbouring countries can reproduce. The only condition attaching to this substantial gift towards economic recovery is that miners and the National Coal Board should have the good sense to bring this new coal to the trucks clean and at a price industries can afford to pay.

RSA Award for Invention

WHAT is the worth of "an entirely new and outstanding contribution to the national economic recovery"? To say that the Royal Society of Arts assesses it at £500 and a gold medal is probably not strictly true, although those are the prizes it intends to confer on May 1 next year on whoever has succeeded in doing what our statesmen have signally failed to do. The RSA, in the past patron and godfather of many historic advances in the arts and practical sciences, certainly looks for something much more tangible and productive than a currency adjustment or a groundnuts scheme in reviving its ancient practice of offering money prizes to the inventive. Concluding that nothing at the moment looms larger than food supplies, the society has stipulated that the invention shall be "a means of promoting the production or the economic utilisation of food in Britain". Thus the RSA has joined forces with multiplicity of influences which from many standpoints are all directed to the same purpose. The common denominator is that chemistry enters into most of the fields concerned. Intending entrants may take heart in the knowledge that the man who gave agriculture superphosphate, Sir John Bennet Lawes, is no longer a possible rival and that the patent rights attaching to the winning invention may well yield several hundred times as much as the prize money.

SYNTHETIC GLYCERIN

(*continued from page* 214)

plant is said to have a capacity of 3 million pounds per month in an installation in which nickel and nickel alloys have overcome the ever present corrosion problems.

All these considerations might seem remote from United Kingdom chemical economics, but for two new facts. Glycerin in bulk now costs £40 per ton more and this country will shortly possess the most advanced plant for large scale petroleum refining.

Chemical Industries: 1948, 63, 3, 374-375. and 1950, 66, 2, 177.
W. D. Mogerman, *Discovery*, 1950, 11, 7, 209-210.

U.S. FERTILISER PRACTICE

Productivity Team Recommends Some Changes Here

IN factory lay-out and in its wide use of mechanical handling and advanced distribution methods the U.S. fertiliser industries have some substantial advantages not shared by their counterparts in this country. These are among the principal findings of the productivity team from the fertiliser industry which returned to this country some months ago after an extended tour, under the auspices of the Anglo-American Council on Productivity, of American fertiliser plants.

The team says in its report* that in America the industry has developed on rather different lines from the industry in this country. In America it has many natural advantages. Notably it does not depend on imports for any of its raw materials and unlimited land has been available cheaply for the erection of its factories, so that it has been possible to follow "straight line" single block design in building.

Agricultural Research Stations

In recent years the American Government has been actively concerned in retrieving the consequences of poor farming practice and the Tennessee Valley Authority, which it created, has developed many new fertiliser materials on a commercial scale. At the same time Government recognition has been responsible, in collaboration with the industry, for the establishment in every State of agricultural research stations. To educate the farmer in the correct and adequate use of fertilisers, to improve crop yields and soil fertility, advisory services on a large scale have also been established.

Because of the vast area of the U.S.A., freight charges have played a large part in the economy of the fertiliser industry. Great attention has been given to the increase in plant food content of fertilisers and development of concentrated types has progressed much faster than in Britain. The development is illustrated by the wide use in compound manufacture of concentrated nitrogen liquors and cyanamide, which cannot be applied in Britain as they would cause the reversion of water soluble phosphates. New types of nitrogeneous fertilisers are becoming popular because of their slower acting properties.

The average plant food content of commercial fertiliser has risen gradually from 18.1 per cent in 1930 to over 20 per per cent, an increase of nearly 13 per cent, and in some compound fertilisers is as high as 28 per cent. It is estimated that this increase has made a saving to farmers of at least $5 million a year in freight charges.

Triple Superphosphate

New records for the production of triple superphosphate have been established and new plants are being brought into production. The report questions whether the saving in distribution expenses in this country would counterbalance the higher manufacturing costs.

Intensive research into soil deficiencies having revealed the need for a number of secondary plant food and trace elements, there has been a demand in certain areas for special mixtures containing these materials. Other recent developments are the use of anhydrous ammonia for direct injection into the soil, mostly on pasture land, the introduction of nitrogenous liquors into irrigation water and the production of freshly mixed fertilisers of granular and large crystalline raw materials for spreading directly on the land by vehicles filled at the factory.

Factory Layout

The layout of the factories visited was superior in design to all but the most modern of British works. The team comments on the wide use of mobile handling equipment and (though there was nothing new in conveying and elevating equipment) the extensive use of shuttle conveyors, eliminating ploughs and throwoffs when sticky material was being handled. Mobile handling equipment facilitated production at much higher rates than are common in Britain.

The report incorporates a general survey of the American fertiliser industry, a description of its factories, its process methods and its manufacturing and handling equipment. Other chapters discuss production, labour, and organisation and administration.

It notes that some American factories are offering a service which comprises a mixing to farmers' own formulæ and bulk spreading on the fields. The transporting

* "Superphosphate and Compound Fertilizers," from the Anglo-American Council on Productivity, 21 Tothill Street, London, S.W.1. or from the Fertilizer Manufacturers' Association, Ltd , 44, Russell Square, London, W.C.1 (3s)

and spreading vehicles, which are either owned by the factory or hired, cannot compete with normal vehicles on haulage alone. They can therefore only be economically operated within a limited radius from the mixing plant.

Among the team's recommendations for action here, to implement some of the successful principles seen in the U.S.A. are these:—

A national survey of soil fertility.

Adoption of the available phosphoric acid standard for fertilisers in preference to the water soluble standard as soon as possible.

There should be an expansion of free exchange of all information designed to increase productivity within the industry.

Propaganda to encourage the correct and wider use of fertiliser.

Continued restriction in the interests of production and economy of the number of different mixtures produced.

Investigation of the possibility of bulk distribution and spreading of granular fertiliser in one operation.

Investigation by the railway authorities of the possibility of increased provision of bottom discharge wagons, in view of the rapidly increasing quantities of bulk material transported by rail.

Technical Recommendations

In the light of its observations of U.S. manufacturing processes the team has produced a large number of technical recommendations. It proposes:—

Centralisation of controls in new or reconstructed acid plants to economise manpower.

The use of simple mechanical devices, such as drag line scrapers, for the rapid discharge of bulk material from railway wagon and of mechanical handling equipment to reduce human effort.

The payment of higher hourly rates for skilled process operations in preference to piece work or bonus rates, except on wholly repetitive work, to raise the status of the skilled worker and encourage individual ambition. Encouragement to workers to take an interest in their factory's production.

The team has also recommended several changes in working conditions:

The supplementing of safety measures by propaganda to make workers safety conscious. Good washing and changing conditions to help maintain the morale of the workers. Provision of refreshments by automatic machines. Simplification of reporting procedure and more mechanised office equipment.

Owing to different methods of measurement of efficiencies the Report states that accurate figures on man-hours per ton were difficult to obtain, but it gives these conclusions:

American practice in acid manufacture is slightly better than British, mainly because of the widespread use of sulphur as a raw material. Centralisation of controls, however, is a contributory factor.

Superphosphate manufacture is greater in America than in Britain. Only British modern continuous processes approach American performance, mainly because of high hourly throughput.

In compound manufacture, packing and dispatch, American processes derive a substantial advantage from the use of mobile equipment for recovery of materials from stock pile to mixing and packing plants.

The handling and storing of raw materials in the two countries is not strictly comparable because of the different layout of American factories and the use of large capacity railway wagons. These two factors give considerable advantages to the Americans.

The average basic rate of pay in the industry appeared high at $1.10 an hour. The range was from the minimum of 60 cents under Federal law to $2.00. Although the cost of living in America is much higher than in Britain, the average American worker has approximately 17 per cent more of his earnings available for non-essentials than the British worker.

Industrial Casualties

NUMBERS of deaths from industrial accidents in the U.K. reported in June disclose an increase over the previous month and over the same period of last year. The total in June was 129 against 103 in May and 116 in June 1949.

In industries concerned with chemicals, oils, soaps, etc., there were only three deaths (one less than in May); metal extracting and refining accounted for one; metal conversion and founding, four; and other metal trades, one; textile manufacture and textile printing, bleaching and dyeing accounted for three.

No deaths were reported from industrial diseases in June under the Factories Act. 1937, or under the Lead Paint (Protection Against Poisoning) Act, 1926. The total number of cases reported, as shown in the *Ministry of Labour Gazette*, was 42, one more than in May. Four were due to lead poisoning; two to anthrax; skin cancer (epithetiomatous ulceration) accounted for 21 (pitch, nine; tar, 12); and chrome ulceration 15 (manufacture of bichromates, seven; chromium plating, eight).

MORE SULPHURIC ACID

Higher Production and Consumption in Second Quarter

DETAILS of production, consumption and stocks of sulphuric acid and oleum in the second quarter of this year, issued by the National Sulphuric Acid Association, Ltd., are given in the tables below. The total production of chamber and contact acid (461,025 tons) represented an increase of 11,940 tons over the January to March quarter. Consumption was also slightly higher than in the previous quarter, the figures being 464,208 tons against 461,094 tons. Increased use by individual industries was particularly marked in oil refining and petroleum products, 15,070 tons (14,886); paint and lithopone, 34,943 (32,006); rayon and transparent paper, 57,772 (57,001); agricultural purposes 1676 (139); bichromate and chromic acid, 3101 (2862); bromine, 3253 (2646).

PRODUCTION OF SULPHURIC ACID AND OLEUM

(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock, Apr. 1, 1950 ...	28,666	29,290	57,956
Production	176,955	284,070	461,025
Receipts ..	52 421	13,803	66,224
Oleum feed	—	1,868	1,868
Adjustments	−24	−102	−126
Use	108,289	113,890	222,179
Despatches .. .	121,996	184,327	306,323
Stock, June 30, 1950 ...	27,733	30,712	58,445
Total capacity represented ...	202,300	292,860	495,160
Percentage production	87.5%	97.0%	93.1%

CONSUMPTION—UNITED KINGDOM

(Tons of 100% H_2SO_4)

Trade Uses	
Accumulators ...	2,319
Agricultural purposes ...	1,676
Bichromate and chromic acid ...	3,101
Bromine	3,253
Clays (fuller's earth, etc.) ...	2,691
Copper pickling ...	592
Dealers	4,975
Drugs and fine chemicals ...	2,966
Dyestuffs and intermediates ...	20,771
Explosives ...	4,167
Export ...	978
Glue, gelatine and size ...	137
Hydrochloric acid ...	16,950
Hydrofluoric acid ...	2,221
Iron pickling (incl. tin plate) ...	24,914
Leather ...	1,894
Metal extraction ...	596
Oil refining and petroleum products ...	15,070
Oil (vegetable) ...	2,123
Paint and lithopone ...	34,943
Paper, etc. ...	1,103
Phosphates (industrial) ...	1,161
Plastics, not otherwise classified ...	5,186
Rayon and transparent paper ...	57,772
Sewage ...	2,800
Soap and glycerin ...	3,866
Sugar refining ...	150
Sulphate of ammonia ...	65,678
Sulphates of copper, nickel, etc. ...	6,353
Sulphate of magnesium ...	1,404
Superphosphates ...	122,626
Tar and benzole ...	4,620
Textile uses ...	6,041
Borax and boracic acid ...	Included in Unclassified below
Chlorsulphonic acid ...	
Formic acid ...	
Oxalic, tartaric and citric acids	
Phenol (synthetic) ...	
Rare earths	
Sulphate of alumina ...	
Sulphate of barium ...	
Sulphate of zinc ...	
Unclassified: — ...	39,106
Total	464,203

RAW MATERIALS

(Tons)

	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock, Apr. 1, 1950 ...	67,619	182,434	61,127	24,915	730
Receipts ...	54,048	55,806	109,711	45,198	49,366
Adjustments ...	+724	−1,069	−79	−184	—
Use ...	54,567	47,304	91,622	43,587	49,261
Despatches ...	945	4,344 266*	476	933	—
Stock, June 30, 1950 ..	66,879	185,257	78,661	25,409	835

* Used at works for purposes other than sulphuric acid manufacture.

Health Service Prescriptions

A REPORT has been published by the Ministry of Health, which gives guidance to doctors in the Health Service in deciding in borderline cases what preparations should be regarded as toilet requisites and therefore should not be prescribed free. The report will be of interest to the manufacturers and producers of the chemicals they contain.

Examples of items not to be prescribed are given as astringent lotions, bath salts, cold creams, face powders, hair tonics, hand creams, shampoos, shaving creams, soaps, and styptics, skin lotions, soaps, tooth pastes, powders, talcum powders, vanishing cream. The report also recommends that certain proprietary preparations for which prophylactic and therapeutic claims are made should not normally be prescribed if they may be used for routine toilet purposes. Included among those quoted are anti-midge and barrier creams and medicated soaps.

LABORATORY TRAINING

Replacement of Physicists' Certificate

THE Board of the Institute of Physics has announced that the Institute's certificate in laboratory arts will not be awarded after 1951, in view of the establishment of the intermediate certificate for laboratory technicians by the City and Guilds of London Institute, which it welcomes.

During his presidential remarks in 1932 Lord Rutherford had suggested that the Institute should do something to promote the welfare of technical research assistants. The board, believing that the success of many physicists' work greatly depended on the skill of these men, actively pursued this suggestion.

The first step was to make available proper courses of training, success in which should lead to a widely recognised certificate. With the co-operation of various colleges the Institute's scheme was adopted in 1934 and the standard of successful candidates has been commendably high.

For some time a need has been felt for a certificate which would be of value to technicians in a wider range of laboratories. After consultation, the City and Guilds of London Institute agreed in 1949 to set up an exploratory committee on which the Institute of Physics was represented to suggest suitable conditions and syllabuses for such an award. The work of this committee has resulted in the publication of regulations and syllabuses which come into operation in the session 1950-51.

The City and Guilds of London Institute has agreed that holders of the Institute of Physics certificate shall be eligible to enter the course for the advanced laboratory technicians certificate, to be established shortly on the same terms as the new intermediate certificate. This is regarded as a fitting recognition of the standard which the Institute of Physics certificate holders had reached and of the pioneer work which that certificate represented. Students who have already begun courses for the Institute of Physics certificate will be able to complete these by 1951, after which the Institute of Physics will no longer examine in laboratory arts.

The board of the Institute has formally recorded its appreciation of the important work of those who have established and taught the course for its certificate and hopes that their work will be continued under the new scheme.

B.A. PAPERS

Diverse Topics at Birmingham

A LARGE number of items in the programme of the 112th annual meeting of the British Association for the Advancement of Science, to be held in Birmingham from August 30 to September 6 inclusive, are associated with the subject of the presidential address on Man's Use of Energy, which Sir Harold Hartley will give at the inaugural general meeting at 8.30 p.m. on Wednesday, August 30, in the Town Hall, Birmingham.

Section B (Chemistry) addresses and papers, to be given in the main building, large chemistry theatre, University of Birmingham, will include the following:—

Thursday, August 31.—Sectional presidential address by Professor E. L. Hirst on modern developments in carbohydrate chemistry. Papers: "Seaweed Polysaccharides," by Dr. E. G. V. Percival; "The Enzymes Associated with Starch Metabolism," by Professor S. Peat.

Friday, September 1.—Papers on the chemistry of plastics, rubber and fibres: "The Degradation of High Polymers," by Professor H. W Melville; "Physico-Chemical Methods in the Study of Fibre Formation from Synthetic Polymers," by Dr. F. Happey; "Natural and Synthetic Rubbers - a Comparison," by Mr. A. E. T. Neale; "Structural Characteristics Which Determine Plastics, Rubber and Fibres," by Mr. G. Dring and Dr. R. F. Hunter. Colour film, "The Future of Plastics."

Monday, September 4.—Papers on chromatography: "Some Recent Developments in Chromatography," by Dr. T. I. Williams; "Partition Chromatography, with particular reference to Amino Acids," by Dr. C. E. Dent; "Inorganic Chromatography on Cellulose," by Dr. F. H. Pollard. Films on chromatographic and microchemical techniques.

Tuesday, September 5—Papers on chemical energy: "Chemical Energy of Combustion Reactions," by Professor F. H. Garner; "Chemical Energy of Reactions other than Combustion," by Dr James Taylor; "Direct Conversion of Chemical Energy to Electrical Energy," by Dr. H. J. T. Ellingham; "The Building Up of Chemical Energy," by Professor F. G. Gregory.

Wednesday, September 6. Papers on chemistry of muscular contraction: Introduction by Professor E. Baldwin; "Adenosinetriphosphate and the Isolated Myofibril," by Dr. S. V. Perry; "Shortening of Muscle During *Rigor Mortis*," by Dr. J. R. Bendall.

There is a B sectional reception and tea, by invitation of the Midland Chemists' Committee, planned to take place at 4 p.m. on Wednesday, August 30, in the sectional committee rooms of the Birmingham University. A number of visits to chemical and other works have been arranged.

Autumn Metals Meeting

The Institute of Metals is to hold its 42nd annual autumn meeting at Bournemouth from September 18-22. The scientific and technical sessions will start on September 19. The autumn lecture is to be given by Mr. E. E. Schumacher, chief metallurgist of the Bell Telephone Laboratories, New Jersey, U.S.A.

ALKALI INSPECTORS' REPORT

Prevention of Noxious Fumes and Gases

THE widening scope of the work carried out by the chief inspectors in encouraging or enforcing the observance of the requirements of the Alkali, etc., Works Regulation Act and associated legislation is well illustrated in the 86th annual report (for 1949) on alkali, etc., works (HMSO, 1s. net).

The number of works registered under the Act in 1949 was 969, involving the operation of 1741 separate processes. Compared with the previous year, this shows a reduction of 14 works and 25 processes, but the diminution relates mainly to by-products of the coal carbonisation industry and follows the trend which has been apparent for several years. From the details given, however, it is apparent that the complexity of the work involved in the maintenance of effective precautionary measures against the emission of smoke, fumes and noxious matter generally has increased. This is indicated by the fact that of the 3752 visits paid by alkali inspectors during the year 378 were in connection with works not registered under the Alkali Act.

Among the many special cases described in the report, a large number involving emission of smoke and fumes were effectively dealt with by raising the height of the existing factory chimneys. In a number of cases the installation of more modern plant was advised and duly carried out. In one of these, a lamp black works, an improvement was effected by the installation of the latest means of dust collecting.

Offending Smells

The difficulty of dealing with some of the complaints of works emissions was, as usual, increased by the vague descriptions given to the inspectors of offending smells, etc. This was exemplified by complaints over a wide area of "a strong smell of tomcats."

The cause of the trouble was eventually traced to the operation of an oil additive process. This had been operated for two years and the gases had been burnt during that time in an incinerator without causing offence. A slight change in technique had, however, been made, and this apparently had caused the production of a mercaptan type of gaseous compound which was highly odoriferous and, not being entirely destroyed in the incinerator, could be detected several miles away.

Reversion was made to the earlier process, the combustion of the foul gas was abandoned and caustic soda scrubbing instituted in its place as a temporary expedient. These measures were effective but they are to be regarded as temporary expedients and it will be necessary to establish a permanent solution of what the inspectors' report describes as "this very tricky problem."

Among the many problems with which the inspectors were faced in connection with the emission of fluorine compounds, one which has not yet been brought to a satisfactory conclusion occurred in a factory used for the manufacture of vitreous enamel frits. Compaint had been made of symptoms of fluorosis in cattle grazing on pastures close to these works.

High Altitude Discharges

The enamel glass or frit was made by melting a complex mixture which frequently contained a proportion of fluorine-bearing materials, *e.g.*, cryolite, fluorspar or sodium silico-fluoride. It was estimated that about 10 per cent of the fluorine was evolved in the melting process, but this point has not yet been reliably established. In some other cases of fluorine emissions investigated, the inspectors were left in some doubt as to whether mere discharge at a high altitude provides a sufficient solution.

Investigations at chemical manure works revealed that there have been a number of welcome improvements to scrubbing systems associated with works employing superphosphate processes, and there have also been fewer infractions of the regulations. This has been reflected in a lower average acidity of escaping gases, the comparative figures being 0.088 grains per cu. ft. in 1949 against 0.12 in 1948 and 0.15 in 1947.

The few cases at chemical manure works of infraction of the rules were usually the result of a temporary deficiency of water supply to the scrubber or other abnormal circumstances, and did not warrant prosecution.

In a review of the chemical industry generally, the report offers the opinion that there is reason to anticipate that the high rates of production in 1949 will at least be maintained during the current year.

DEVELOPING TIN USES

Report of the Tin Research Institute

WORK on the alteration and extension of its buildings at Greenford somewhat modified the research programme of the Tin Research Institute during 1949.

The institute's report indicates that research work on tinplate has been concentrated upon improvements in the methods of quality control. Equipment has been designed and will shortly be available for assessing the importance of variables in manufacturing conditions on the corrosion-resistance of tinplate.

New Testing Machines

Further work on factors affecting the life of tin-base bearing metals was put in hand and two new testing machines will be in operation when the laboratory is restored to use.

The possibilities of obtaining new bearing materials by powder metallurgy were examined as this method may give a combination of properties not obtainable by ordinary casting methods.

Some work has been done on the anti-frictional properties of the aluminium-tin alloys, which may provide an attractive alternative to materials hitherto available, due in part to the cheapness (for its bulk) of aluminium.

Intensive technical service has been given to bronze founders with a view to improving the production of commercial bronzes. A machine for the semi-continuous casting of bronze has been designed and is under construction.

Electrodeposition of tin from the stannous fluoborate bath has been under investigation and work on the deposition of tin-lead alloys started. New electrolytes have been designed and examined which may offer advantages in the electrodeposition of tin. Mechanisms to test these with rapidly moving cathodes are being prepared.

Work on electro-deposited tin alloys has been prosecuted actively and the use of these alloys in industry is gaining ground. Tin-copper, tin-zinc, tin-lead are already widely accepted. Tin-cadmium has aroused interest as a rust-resisting coating and other alloys of considerable interest and importance are being developed.

The policy of placing certain investigations with other organisations with special facilities has been extended. The work at Fulmer Research Institute on the metallurgical properties of the aluminium-tin alloys has produced a series of valuable alloys. At Birmingham University work on the sand-casting of bronze showed great promise and fundamental investigations of the theory of tin alloys has been initiated.

Work has also been arranged at Delft University on the application of tin oxide in vitreous enamels and at Utrecht University on organo-tin compounds.

Extra-Mural Work

Numerous other researches were going on in collaboration with laboratories at various universities, Government establishments and industrial organisations on problems of common interest.

More time was devoted to technical service overseas and to the production of up-to-date practical publications, which now cover all major applications of tin.

Methods for improving the resistance of tinplate to rusting and sulphur staining are discussed by R. A. Gillies (chief chemist, Brand & Co., Ltd., London) and illustrated with colour photographs in the same issue of "Tin and Its Uses" (No. 22) which reviews the activities of the International Tin Study Group.

U.S. Metal Powder Standards

TWO new standards have been issued by the Metal Powder Association, New York City. The first is a glossary of terms used in powder metallurgy (MPA Standard 9-50T—Tentative Definitions of Terms Used in Powder Metallurgy). The second (MPA Standard 10-50T—Tentative Standard Tension Test Specimens for Pressed and Sintered Metal Powders) specifies a flat tension specimen and a round machined tension specimen to be used in determinations of the tensile characteristics of pressed and sintered metal powders.

U.S. Titanium Production

A NEW and jointly-owned company to produce titanium metal and its alloys has been formed by the Remington Arms Company, Inc., of Bridgeport, Connecticut, and the Crucible Steel Company of America, New York. The new company will have complete access to the knowledge, patents and manufacturing techniques developed by the parent companies for the production of sheets, rods, tubes, wire, forgings, castings and other fabricated forms of the metal. It plans to maintain a full-scale research programme.

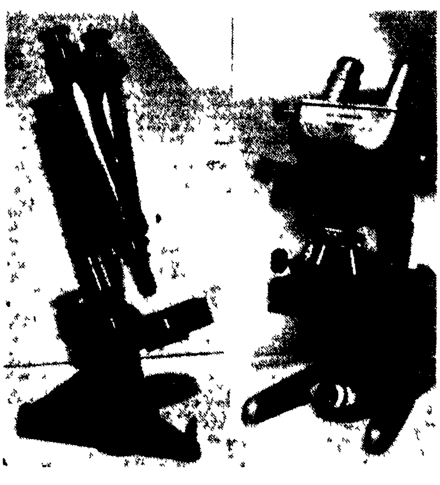
ANALYTICAL CHEMISTRY at the SCIENCE MUSEUM

From A CORRESPONDENT

IT will be some time before the chemistry collections at the Science Museum can be restored to their former state, since the rebuilding operations which have closed the galleries they occupy are not yet complete. A token collection has been on view for some time, but during this month and the early part of September a small special exhibition has been arranged, which had its origin in a suggestion made in connection with the Summer School in Analytical Chemistry which is being given at Imperial College in September by the Royal Institute of Chemistry (London and South Eastern Counties Section).

A small display of new apparatus, it was thought, might benefit members of the school, but the idea was extended and eventually the project was transformed into an exhibition suitable for the general public. It has been arranged by the Science Museum, with the co-operation of the organisers.

The exhibition does not attempt the task of presenting the whole history and present practice of analytical chemistry in four or five cases. Instead it aims to show the average museum visitor that analytical chemistry is a diverse and colourful subject, that its history is not its least interesting aspect and that it is possible to discern two main lines of development: the progress from macro to micro scale, and the introduction of physical methods.



Pasteur's microscope and its modern analytical equivalent

The comparison between the reproduction of the organic analysis apparatus used by Berzelius in 1814 with the Pregl organic analysis train first introduced in 1912 bears a label which shows that the search for methods of reducing the scale of operations is nothing new. Berzelius was successful in reducing his scale from that of ordinary preparative chemistry to that of gram quantities. A corresponding relative reduction in scale did not take place for a long time although there was a constant refinement of technique over the course of the century between Berzelius and Pregl.

Precursors

The normal laboratory equipment of the chemist has seen steady progress, exemplified here by some simple comparisons. An analytical balance of the early nineteenth century is set side by side with its 1950 counterpart. With the balances go volumetric glassware, dated 1830, 1870 and 1950. The 1830 example is a burette which belonged to Gay-Lussac, who was the founder and originator of the whole technique of volumetric analysis, a fact not generally appreciated.

Modern methods are treated in two cases, the first of which shows in simple form the principles of chromatography; an absorptiometer with the parts linked up to a diagram of the optical system; a recording polarograph which has been arranged by the maker to run continuously and provide a trace of the curve for a simple two metal solution over and over again throughout the day; and two microscopes. These tell their own story, one being the microscope which was bought by Whitbreads, the brewers, for Pasteur to use when he visited England in 1878, and the other one of the latest examples of a modern instrument.

Nearby is a new instrument based on an observation made by Faraday in 1850. The position of a freely suspended magnetic ball between the poles of a magnet will alter if a paramagnetic gas is introduced into the field region. All odd-

(continued at foot of next page)

A Kentish Cradle of Chemical Industry

The sulphuric acid plant at Queenborough

"BEING at Queenborrowe Castle in the yeare 1579, I found there, one Matthias Falconer, a Brabander, who did, in a furnace that he had erected there, trie to drawe very goode brimstone and copperas oute of a certaine stone that is gathered in great plenty upon the shoure, neare untoe Minster in this Isle."

This extract, quoted in Lambert's "Perambulations of Kent," is believed to be the oldest known record of any chemical works in Britain. Possibly the manufacture of chemicals may have been undertaken in this country at an even earlier date, but the unique interest of this authentic record lies in the existence today of a modern chemical works, established on the very site where—nearly 400 years ago—Matthais Falconer, the Fleming, erected his furnaces and made sulphuric acid from the sulphur contents of pyrites gathered from the cliffs and beach at Sheppey and made sulphate of iron from the burnt ashes from the furnace.

Not many years ago reconstruction of the foundations of the present sulphuric acid plant led to the discovery of the old pits in which the copperas was made. During the intervening centuries many other processes have been employed on the same site for the manufacture of various chemical products.

It was during the latter part of the 19th century that the late William Carr Stevens founded the company known as the Sheppey Glue & Chemical Works, Ltd., which, apart from the link with Matthias Falconer, has a history going back more than 100 years. As far back as 1847 William Carr Stevens, and before him his father, made organic fertilisers by dissolving bones with acid at their works at Bow Common, London. So successful was this venture that eventually the Bow Common works became too small to cope with the demand for these fertilisers, and for this reason the Queenborough site was purchased in 1886.

The manufacture of sulphuric acid and glue is still undertaken on the site formerly occupied by the furnaces of Matthias Fleming, but the degreasing of bones for the glue process was established on the second Sheppey site. The latest type of superphosphate den has been erected on this site, where the manufacture of superphosphate, compound fertilisers, organic and inorganic fertilisers is carried on in buildings that cover several acres.

ANALYTICAL CHEMISTRY AT THE SCIENCE MUSEUM

(continued from previous page)

electron molecules are paramagnetic—NO, NO_2 are examples—but the most important one is oxygen, which although having an even number of electrons is believed to contain two with unshared spins. It thus becomes possible to measure the oxygen content of a gas continuously by observing its effect on a magnetic system.

Two entirely new departures occupy another case. Radiochemistry and tracer technique have been possibilities ever since the idea of isotopes was first put forward. Only since the supply of isotopes was put on a general distribution basis has it been possible for the radioactive tracer technique to become a daily tool of the research worker.

The essential points are brought out in this exhibit. Radiochemical methods can detect and estimate smaller amounts of material than any other, and the equipment used is simple in principle if complicated in actual execution.

The other new technique is microbiological assay. Actual cultures are used to outline the principles of the way in which substances are estimated by their effects on the growth of bacteria or moulds.

Finally, there is a display of microanalytical apparatus made in the laboratories of some of London's technical colleges.

CHEMISTS' SERVICE IN FIRE RESEARCH

Practical Studies of Combustibles and Suppressors

by A. G. THOMSON

THE highly inflammable liquids used in modern industry present special fire risks the control of which presents a wide and varied field for chemical research. The chemist is also associated with many other aspects of fire protection such as the phenomena of ignition and combustion, the use of various chemicals as extinguishing agents, the effectiveness of wetting agents, etc. In many ways the chemist is making a major contribution to the science of fire prevention and extinction.

Before the establishment of the Chemistry Section with the newly formed Joint Fire Research Organisation at Boreham Wood, the fire research programme was developed by a team under Dr. J. H. Burgoyne in Professor Sir Alfred Egerton's department at the Imperial College of Science and Technology, London.

Continuing investigations started during the war, the spontaneous heating of palm kernels stored in jute sacks has been studied.

Self-heating in the materials of the palm kernel stack was investigated under controlled laboratory conditions. The moistened materials were enclosed in an adiabatic reaction vessel, through which a slow stream of saturated air was passed. The effluent gas was analysed and measurements were made of the rate of oxygen absorption, evolution of carbon dioxide and heat evolution. The materials examined included palm kernels, both clean and contaminated jute bag fabric and a mixture of palm kernels and contaminated bag fibres. Only in the case of the palm kernels was there any indication of a reaction likely to raise the temperature above some 75° C., the maximum value which could be accounted for by biological activity.

Cause of Self Heating

It was considered, therefore, that self-heating above 75° C. was probably due to causes other than biological activity, and was most readily explained by normal chemical oxidation of the original materials or of the products derived from them by previous biological reactions. The former possibility was examined both by studying the kinetics of the reaction between oil extracted from jute bags used for the storage of palm kernels and oxygen at temperatures of 80° C. or higher and also by determination of the evolution of heat during the course of the reaction.

In general, it was found that, given an adequate supply of moisture, microbiological heating might occur in palm kernel stacks with a consequent rise in temperature up to 60-75° C. If a stack is laid down in the standard manner using only dry bags of kernels, is protected against water, and is subject only to the normal atmospheric conditions prevailing at the London Dock, the relative humidity of the air in the stack is unlikely to be high enough for a sufficient time for significant microbiological heating to occur. At temperatures above that at which microbiological action would be expected, independent exothermic chemical reactions might occur.

An interim report of these investigations was included in "Fire Research 1948" and a review of the data obtained is being prepared for publication.

Fire Hazards in Wool

Oils are used in the woollen industry to facilitate the processing of wool. While wool itself is less inflammable than many other textile fibres, the addition of oil may be expected to increase the fire hazard. The oils formerly used for this purpose were mainly neutral vegetable oils and oleines. In recent years considerations of cost and supply have led to the substitution of mineral oils. At the request of the Fire Offices' Committee the Joint Fire Research Organisation undertook an investigation to develop a simple means of assessing the relative hazard of the various oils employed under the conditions of use.

During a preliminary survey of represen-various oils particular attention was given to ease of ignition as measured by the flash-point, and by ignition tests with small igniting sources. The next step was to see how the rate of flame spread on oiled wool was influenced by these properties and by the amount of oil present. A close parallel was observed between the results of the laboratory tests and the rates of burning of oils on a measured length of horizontal asbestos cord.

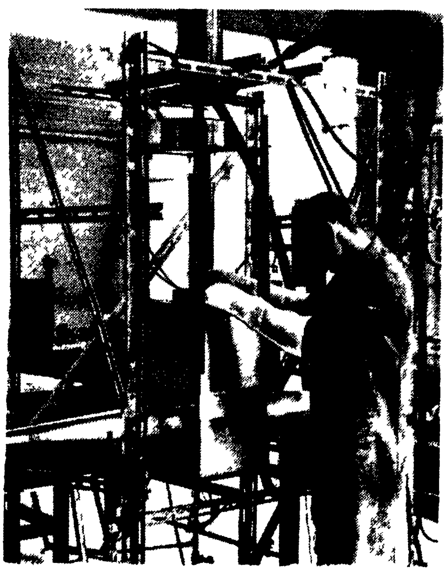
The spontaneous combustion of oils and seeds is being investigated by the following method. A weighed quantity of oil is

applied to a fibre, which is surrounded by a bath of boiling water. The rise in temperature is then measured against time. If an oil is not liable to spontaneous heating the temperature will not exceed 100°. Active oils show a more rapid temperature response.

When wood is heated it decomposes at a rate which becomes extremely rapid at about 275° C., and at temperatures somewhat lower than this ignition will take place in the presence of a pilot flame. There is also a widely held theory that if wood is heated for a long time at a temperature considerably below its ignition temperature, it is converted into a highly active form of charcoal which ignites spontaneously in air at temperatures well below the ignition temperature of the original wood. This has a direct bearing on the recognised hazard presented by woodwork in close proximity to heating appliances, hot water pipes, exhausts, etc.

Effect of Pre-heating

Both sawdust and 1 cm. cubes of wood have been investigated in an apparatus designed to determine the effect of pre-heating on ignition temperature. The specimen is preheated in a thermostatically controlled oven for periods ranging from a week to several months. The ignition temperature of a sample is then determined, either in oxygen or air. The ignition temperature of the preheated wood has proved to be lower than that of normally dried wood, but not sufficiently low to permit ignition by steam pipes.



Investigating the effect of droplet size on the extinction of oil fires

This investigation will be extended in the near future by preheating wood in an inert atmosphere and then determining the ignition temperature.

Fires in liquid storage installations present a special hazard. Attention is being given to the inhibition of the combustion of vapour of certain pure compounds by the addition of a volatile inhibitor in the liquid phase. In these conditions the effectiveness of the inhibitor depends not only on its capacity to prevent flame propagation when present in the vapour phase, but also on the relative volatilities of combustible and inhibitor which determine the concentrations in the vapour phase.

It is possible by selecting an inhibitor with a much greater vapour pressure than a particular liquid fuel, to produce such a mixture that the vapour in equilibrium with the mixture is non-inflammable although the vapour of the same composition as the liquid phase would be inflammable. This presents a possible method of protecting liquid fuel installations.

Aviation spirit and aviation kerosene were selected as examples of their respective classes of fuels and also as being likely to present the greatest practical difficulties. The effects of various inhibitors have been studied, including methyl bromide, methyl iodide, dichlorodifluoromethane, chlorotrifluoromethane and sulphur hexafluoride. The results of the experiments suggested that this method of protection was not practicable for aviation spirit with the inhibitors at present available, and of doubtful practicability for kerosene.

Comparison of Inhibitors

The effects of such inhibitors as methyl bromide and carbon tetrachloride on liquid fuels and explosive atmospheres are still being studied. The objects of this investigation are to compare the efficiencies of various inhibitors and also to determine their quantitative effects, in order to obtain the necessary data for applications both in the open and in closed rooms, such as transformer houses.

A constant flow apparatus is being used at present for this investigation. The combustible gas, air and inhibitor are mixed in the desired quantities and allowed to flow through the apparatus until the air has been displaced. The mixture is then tested by a gas flame at the bottom of the tube. If the mixture is

within the explosive limits, a flame will be propagated up the tube. The limit of inflammability is reached when the flame just fails to ignite the gas mixture. Typical combustibles used are coal gas, hexane and petrol.

The application of water sprays to the extinction of oil fires is being investigated by means of an apparatus capable of producing sprays of known droplet size, which permits both the size of the drops and the rate of delivery to be varied.

The oil used for this experiment is kerosene, which floats on water in a brass pot. Over the pot is a chimney which is covered with long sliding panels to form an asbestos box. Air is admitted through two side arms and circulates through holes in the bottom of the chimney.

Method of Spray

The spray consists of a number of hypodermic needles fitted to a brass plate and is located at the top of the chimney. Water is allowed to flow through the needles from a cylinder above the spray. Each needle is fitted with a nipple which allows a blast of air to be blown vertically downwards past the needle. The rate of flow can be altered by varying the air pressures in the cylinder and the droplet sizes by varying the air flow past the ends of the needles.

The kerosene is ignited and allowed to burn for a short time. The spray is then applied to the fire for a measured period, during which the fire is smothered. The purpose of the investigation is to determine the most effective droplet size and rate of flow for extinguishing oil fires. The results so far obtained indicate that very large droplets tend to accelerate the rate of burning, due to agitation of the kerosene. At the other extreme, there is evidence that with smaller droplets the rate of burning decreases both with decreasing droplet size and with increasing rate of water flow.

Foam Compounds

During the war, a test to compare the efficiency of different foam compounds in extinguishing petrol fires was developed at the Chemical Research Laboratory by Dr. N. O. Clark. This test is based on the ratio of the rate of coverage of petrol by foam to the rate of consumption of the foam blanket by fire.

The Joint Fire Research Organisation has developed a controllable apparatus for the continuous production of foam on a small scale, thereby facilitating the examination of foam compounds and the qualities of foams produced with them.

Investigating the time taken to destroy foam blankets

In the latest apparatus petrol contained in a metal tray has a rectangular free surface measuring 42 in. by 8 in. Foam having a known shear strength and a known expansion factor is fed from a compressed air foam generator down a chute and on to the petrol surface, and the rate of coverage of the petrol is observed. An 8-in. length of the foam blanket is then removed from the tray at the end farthest from the chute, the exposed petrol is ignited, and the time taken to destroy a further 8-in. length of the blanket is observed. The end point of the process is indicated by the ringing of an electric bell operated by a fusible link placed in the foam.

Other Investigations

Several special investigations involving work on foam compounds have been undertaken. One of these was designed to examine the possibility of diluting normal foam compounds for the purpose of producing the low viscosity type of compound required in some RAF crash tenders. A method developed jointly by the Fire Research Organisation and the Chemical Research Laboratory proved to be satisfactory.

Experiments were made during the war at the Forest Products Research Laboratory on the addition of chemicals to water used for fire fighting. This investigation is being continued by the Joint Fire Research Organisation. It is considered improbable that wetting agents will give any advantage in fire extinction, which is largely a matter of cooling. By ensuring an even distribution of the liquids applied to unburnt materials, however, they may assist in the prevention of spread of fire.

A NEW PLASTICISER

Potential Replacement for Dibutyl Phthalate

THE recent emergence of dicapryl phthalate, a light-coloured high boiling ester having all the desirable properties of the well known plasticiser, dibutyl phthalate, may prove to be of considerable importance to plastics manufacturers.

While it corresponds closely with the dibutyl ester, it has not the latter's volatility, which has always proved a limiting factor in its application, particularly during the mixing, milling and calendering of vinyl compounds.

Generally, the plasticising efficiency of dicapryl phthalate is equivalent to that of dioctyl phthalate but the former gives superior heat stability.

Dicapryl phthalate is a clear, pale amber coloured liquid possessing a slight fruit-like odour. It boils at 229° C. at 4.5 mm. and freezes at −60° C.; flash point is 395° F. and fire point 440° F. The liquid tends to thicken at −20° C. but does not crystallise at −60° C. It is a very viscous gel at this temperature. Dicapryl phthalate is less than 0.03 per cent soluble and the solubility of water in the ester at the same temperature is less than 0.15 per cent.

Solvents for dicapryl phthalate are acetone; methyl hexyl ketone; ethyl ether; ethyl cellosolve, ethylene dichloride; mineral spirits; benzene; xylol; ethyl alcohol and butyl alcohol. The saponification number of the plasticiser is 277-287 (mgm. KOH per gm. of plasticiser) and the acid number is less than 0.22.

Compatibility

Dicapryl phthalate ester is compatible with a large number of common plastics, including polyvinyl chloride, acetate and copolymers; nitrocellulose; ethyl cellulose; polyvinyl butyral; alkyd resins; synthetic rubbers and natural rubber and certain types of acrylic esters. It is particularly suitable for polyvinyl chloride and copolymers and in the U.S.A. it finds wide use in fabric-coating compositions and extruded vinyl stocks when low temperature flexibility and low volatility are required.

Dicapryl phthalate has the additional advantages of being economical in yielding stocks with good water resistance, fair oil resistance and flame-resisting properties.

Among the principal attractions of dicapryl phthalate to the plastics manufacturer are these:—

1. It is widely compatible with vinyl resins and several other plastics.
2. Its high plasticiser efficiency (as measured by 100 per cent modulus) is equivalent to that of dioctyl phthalate.
3. The slight sacrifice in colour is fully compensated by the fact that dicapryl phthalate has a higher boiling point than dioctyl phthalate and a lower volatility. In addition, it has better ageing properties and greater heat stability. Tests carried out by the Rohm & Haas Company (which has pioneered the development of dicapryl phthalate in the U.S.A.) show that stocks containing this plasticiser exhibit less discolouration and embrittlement after seven hours at 150°C. than do dioctyl phthalate stocks after 3.5 hours at the same temperature.
4. Stocks containing dicapryl phthalate exhibit very low extraction by solvents; 100 octane petrol and aromatic fuel have no effect at all on plasticised vinyl resin and mineral oil gives an extraction loss of 9.2 per cent weight change—against 9 per cent for dioctyl phthalate. This figure, although much higher than that obtained by use of polyester type plasticisers is considerably lower than the percentage shown for the sebacates.
5. Dicapryl phthalate is non-corrosive, possesses no objectionable smell and its use does not introduce any serious hazards in the way of toxicity and dermatitis risks.

The availability of dicapryl phthalate to the plastics industry seems likely to enlarge considerably the scope and usefulness of the phthalates. When used alone or in conjunction with other esters this phthalate should prove a very acceptable material for manufacturers of vinyl resin goods, particularly calendered stock and extruded goods.

Statistical Methods Conference

The Industrial Applications Section of the Royal Statistical Society is organising a conference at Sheffield University on scientific method in industrial production, at which technicians and managements of manufacturing concerns will be able to meet statisticians interested in industrial problems. The conference will continue from 2.30 p.m. on September 29 to the afternoon of Sunday, October 1.

WIDENING USES OF CHROMATOGRAPHY

An Outline of Possibilites in Industry

BASICALLY, chromatography is a tool for the separation of complex mixtures and it owes its usefulness partly to the fact that it is highly specific in separating even closely related substances and partly to its universal applicability to a very wide range of products and problems.

This is the theme of a brief report dealing with "Chromatography in Industrial Research", published by Mactaggart and Evans, Ltd., Sondes Place Research Institute, Dorking.

The report considers the most striking achievements have been in investigations involving naturally-occurring substances such as vitamins, hormones, natural pigments and antibiotics.

One of the great difficulties associated with this kind of work is that the substances which are of interest often occur in nature in exceedingly low concentrations and consequently solvent extraction produces, of necessity, very dilute solutions. The simplest use of chromatographic methods is for concentrating solutions obtained in this way. If the dilute solution is passed through a column of suitable absorbent, the substance sought can subsequently be eluted with a small amount of a suitable solvent to give a relatively strong solution.

A more important use of chromatography in research on these problems is the separation of complex mixtures. The older methods of fractional distillation and crystallisation presuppose some knowledge of the nature and characteristics of the components of the mixture to be separated.

Preliminary Examination Unnecessary

In using chromatography, no pre-knowledge whatever is required. The unknown solution can be chromatographed without any preliminary examination, and information on the complexity of the mixture is immediately forthcoming. An intensive chromatographic examination with several different adsorbents and solvents, will give a number of fractions, each in a fairly high state of purity, which can be used as the starting point for a chemical investigation.

This application, which may be regarded as an aid to organic preparative work, is closely allied to the use of chromatographic adsorption in chemical analysis. With easily characterised substances for which satisfactory analytical methods are available, there is nothing to be gained by using this technique, but in the examination of natural substances it can be of great value.

Such substances, which are frequently of rather indefinite chemical composition, give chromatograms which vary in a characteristic manner with materials from different sources. In tannin analysis, the source of the tannin can be traced from the appearance of the chromatogram. The identity of two substances can be tested quite easily in a chromatographic column: if a mixture of the two cannot be resolved with several different solvents there is a very high probability that they are identical.

Chromatographic adsorption provides a simple and rapid method of ascertaining whether a substance is a single chemical entity of a mixture. This is particularly useful in the examination of commercial dyestuffs, many of which are mixtures of two or more components.

Separation of Ionic Compounds

Most of the applications mentioned hitherto have been in the field of organic chemistry, the reason being that it is here that there has been the greatest need for a refined separation technique. Much work has been done in recent years, however, on inorganic chromatography and there is no doubt that increased interest will be shown in the future. Many ionic compounds can be separated on alumina columns but the procedure is less straightforward than with organic substances. Anions and cations become separated in the column by base-exchange with impurities invariably present, and therefore it is usually necessary to detect the anions and cations in two separate experiments. The precipitation of basic salts in the column must also be guarded against, by pre-treating the column with dilute acid. This introduces a further complication because the adsorption of any individual ion is very susceptible to changes of pH.

As relatively few ions are sufficiently highly coloured to manifest their presence in the chromatogram, chemical treatment of the column is necessary after the solution has been passed through it. Metals which form coloured sulphides can be revealed by treatment with a dilute solution of hydrogen sulphide. It is

usually possible to find some reagent which will give coloured products with metal ions, but the difficulties are much greater with anions and consequently their separation by chromatography has not been greatly developed.

When the field has been surveyed more systematically, it is not unlikely that comprehensive schemes will be drawn up for qualitative inorganic analysis which will replace some of the time-consuming chemical methods now in use.

Finally, although we are concerned here mainly with the applications of chromatography to research, a word should be said about the possible uses of the technique in industrial processes. Some successful work has been carried out on very large columns and there is no reason, in principle, why these methods should not be satisfactory for concentrating dilute solutions of valuable products or separating complex mixtures on a large scale.

Substances which have been examined chromatographically include alkaloids, amino acids, anti-biotics, butter, carcinogenic agents, carotenoid pigments, coffee, drugs, dyestuffs, fission products, foodstuffs, high polymers, hormones, inorganic ions, isotopes, liver extracts, metal ions, milk oils and fats, penicillin, petroleum hydrocarbons, plant pigments, proteins, rare earths, sugars, urine, vitamins.

Glass Production Efficiency

THE marked increase in the rate of productivity in industries since 1935 and 1937 finds further testimony in the current publication of Census of Production dated for 1948. The latest summaries (*The Board of Trade Journal,* 2797) relate to glass containers and glass other than containers. The value of production by the former industry in 1935, 1938 and 1948 (in £000) was £6584, £8201 and £20,765. The 67 factories operating in 1937 and 1948 employed only 4388 more in the latter year (23,874) than in 1948. The value of output per person rose in that period from £260 to £491.

The same trend is shown in the other glass category, which includes scientific glassware and optical glass. Its output rose from £7.8 millions in 1937 to £20.8 millions in 1948. Net output per worker rose in the same period from £261 to £533.

A provisional index of glass industry production in April this year, issude by the Central Statistical Office, stands at 138, compared with 135 in the first quarter of the year and 130, 122 and 107 in the three preceding years. The index figure for chemical and allied trades was 136 in April (128, 120 and 105 in 1949, '48 and '47).

INDUSTRIAL FINISHES

Enamel and Metal Coatings

THE importance of good finish whether of industrial machinery and equipment or of domestic ware is becoming increasingly recognised. Evidence of this will be provided by the first exhibition of Industrial Finishes to be held at Earls Court, London, at the end of this month.

Failure of finishes has been found by investigations of the Council of Industrial Design to be due more often to ignorance than to bad workmanship, although choice of finishes was frequently unduly influenced by cost.

Help for Production Planners

The council intends by its display to help designers and technicians to avoid pitfalls in the early planning stages of production. Mural displays of methods to be avoided or adopted from illustrations in the booklet "Design for Vitreous Enamelling," produced by Vitreous Enamellers Association (in collaboration with the council) will form a setting for sections of sheet and cast iron correctly and faultily fabricated to receive a vitreous enamel finish.

Among the items on view for the first time are a high quality coloured electro-brightening finish on die-castings and a high-temperature resisting vitreous enamel finish demonstrated on a gas cooker grid. Other displays on the stand include a vitreous enamel, free from lead, which can be applied to aluminium and a speculum plating on tin alloy which is particularly resistant to sea water and humidity.

U.S. Licences for Scottish Firms

SCOTTISH manufacturers who wish to manufacture American goods in Britain under licence have been offered the chance by the Scottish Council (Development & Industry).

A delegation of the council recently in the U.S.A. proposed a link-up between small manufacturers like that existing between many of the large concerns in both countries. The ECA authorities found some 70,000 manufacturers interested in such a scheme—which would open sterling markets at present barred because of dollar restrictions. The Scottish plan has thus been given ECA approval, with the proviso that all Marshall Aid countries should share in the scheme. The council is urging the earliest application for contacts with suitable U.S. firms in order to benefit by the granting of exclusive manufacturing rights for the sterling area.

OVERSEAS CHEMISTRY AND INDUSTRY

RISING FRENCH PRODUCTION

Acetone Equipment Installed

THE first report of the committee set up to examine the modernisation of the French chemical industry has just been published. It declares that France will have to re-equip the industry if foreign competition is to be met, and proposes that a sum of about £175 million should be invested by 1953.

One production aim is to make available 500,000 tons of nitrogen per year, about double the present production. French phosphate fertiliser needs are about 800,000 tons of P_2O_5. Yearly consumption is about 450,000 tons, but the report maintains that it will increase to 600,000 tons in 1953. It also supposes that France should be able to export about 160,000 tons.

Sulphuric acid needs in 1953 are estimated to be 1.77 million tons, of which 645,000 tons would be used in the artificial textile industry. Present production capacity is about 1.6 million tons.

The report also discusses plastic production in 1947, observing that it was only 6 per cent of the American output. While calling for a large increase in plastics production, the report gives warning against the production of low price, poor quality plastics.

More Sulphuric Acid

Official summaries of French chemical production during June disclose a considerable increase in production of sulphuric acid—95,000 tons against 88,000 tons in May. Fertiliser production was more or less at the same level as in May.

The French Société Naphthachimie's project for the production of 60,000 tons of naphtha per year as well as 10,000 tons of acetone and 17,000 tons of solvents and other chemicals, is almost completed. The plant will be working fully by 1952. Shell-St. Gobain also announces the installation of equipment for the production of from 10,000 to 12,000 tons of acetone from propylene, extracted from gas from its oil refineries. The technical research is now ended. The Compagnie Française de Raffinage-Ugine-Rhone-Poulenc has installed equipment for the production of from 10,000 tons to 12,000 tons of acetone from the same source.

Talks are now going on in France regarding the building of a carbon black plant with production from petrol by-products.

BRAZIL'S CHEMICAL PLANS

Soda Ash and Caustic Production

THE annual report of the Brazilian Government-controlled Cia. Nacional de Alcalis indicates that present plans provide for the erection of a plant in the Cabo Frio area with an annual capacity of 100,000 tons of calcium carbonate (instead of 50,000 tons as previously planned). This would result in an output of 45,000 tons of caustic soda, 33,000 tons of soda ash and smaller quantities of various by-products.

Growing Capital Needs

To obtain the proposed loan of U.S.$7.5 million from the Export-Import Bank, the company's capital was raised from Cr$50 million to Cr$100 million. The loan contract was not signed, however, and in the meantime further investigation has shown that the capital should be increased to Cr$150 million and that the amount of the proposed American loan should be increased to $10 million, to be used for the purchase of equipment abroad. The report emphasises that the carrying out of this project would bring about a substantial reduction of Brazil's imports of caustic soda and soda ash, which now amount to a value of Cr$200 and Cr$80 million respectively.

The Brazilian Congress is shortly to be asked to approve the granting of a Government guarantee for a loan of U.S.$35 million, to be requested from the International Bank for Reconstruction and Development by a Brazilian company for the exploitation of the Amapá manganese occurrences. The company is to be formed jointly by Indústria e Comércio de Minerios, S.A. (which has been awarded the concession and the Bethlehem Steel Corporation, the former contributing 51 per cent of the share capital and the latter 49 per cent. If present plans materialise, large-scale operations may be possible in 1952 or 1953, upon completion of the proposed railway linking the Amapá manganese deposits with the Amazon ports of Macapá and Santana. The initial annual production is estimated to be 300,000 tons.

Silver-Lead in Tasmania

A report from Montana Silver-Lead N.L., Zeehan, Tasmania, indicates that a considerable tonnage of ore, which the company will treat later, is being developed by contractors.

OVERSEAS

Ultrasonics for Concrete Testing in U.S.

Included in the equipment of a new cement research laboratory in the U.S. is a soniscope which, by means of fast sound waves, is used to measure the mechanical properties of concrete structures.

U.S. Tin Recovery

According to the U.S. Bureau of Mines, 8798 short tons of tin were recovered by U.S. de-tinning plants in 1949. Clippings and old cans yielded 3654 short tons, of which 3195 short tons was claimed as metal, and 459 short tons in the form of tin compounds.

Aluminium Plant for U.S.A.

A dismantled German aluminium plant, which used to produce primary aluminium in Bavaria, and was awarded to the U.S.A. by the inter-Allied reparation agency, is being offered for sale to United States buyers by the U.S. State Department. It has an estimated annual capacity of 18,000 metric tons of pig aluminium.

Chile's State Petroleum

All petroleum deposits in Chile have been made inalienable property of the State. Under a new law published last month in the Official Gazette, the functions and rights of exploiting and working all petroleum deposits and of refining and selling its by-products will be carried out by the newly established National Petroleum Company of Chile under the direction of the Corporacion de Fomento de la Produccion.

New Jugoslav Metallurgical Institute

A new metallurgical institute was opened on July 1, in Ljubljana, Jugoslavia. In addition to the usual research departments, it includes a smelting department for the experimental manufacture of different kinds of steel. Special attention is to be paid to the properties of alloys, including their resistance to chemicals.

Contract to Make the Hydrogen Bomb

The Du Pont de Nemours chemical company has been selected by the U.S. Atomic Energy Commission to design, construct, and operate new facilities for developing the hydrogen bomb, other atomic weapons or fuels potentially useful for power purposes. The company will receive only a token fee of one dollar and the Government will pay all costs. Du Pont built and operated the first atomic energy plant at Hanford, Washington, which ceased operation in 1946.

Chilean Nitrate Strike Ends

The strike at Maria Elena, which produces 25 per cent of Chile's nitrate, ended last week. Output lost by the strike which began on June 14 was estimated at 60,000 tons.

U.S. Aluminium Production

Output of primary aluminium in the U.S.A. in April totalled 58,024 short tons, which was slightly below that of March (58,747 tons). Stocks at the end of April increased from the March level of 11,628 tons to 13,637 tons.

French Oil Refinery Reconstruction

Reports from France indicate that reconstruction of the Merkwiller oil refinery near Pechelbronn, which was destroyed during the war, has almost been completed. The plant employs 2500 persons and last year's production totalled about 50,000 tons. It is expected that production for the current year will total 60,000 tons.

Queensland Coal Deposits

The Queensland State Government recently instigated a technical investigation of the coal deposits in Queensland. It was discovered that the State possesses a wide range of types of coal, including per-hydrous coals which develop coking properties at a lower maturity than British coals. In addition, these coals give a higher yield of oils and tars on carbonisation than do equivalently mature British coals.

Saudi Arabian Oil Figures

Crude oil production in Saudi Arabia during May amounted to 17.1 million barrels, an average of 550,911 barrels per day. This compares with a daily average of 502,159 barrels in May, 1949. Crude production in the first five months of this year totalled 71.6 million barrels against 77.6 million barrels in the same period of 1949.

Swiss Chemical Exports

Official Swiss trade returns record that exports of chemicals, pharmaceutical products and dyestuffs amounted in June to Swiss Fr. 40.6 million as compared with 42.2 in May. Exports of dyestuffs and indigo have shown a marked decline to S.Fr. 14.1 million from 17.9 million. Shipments of pharmaceuticals rose from S.Fr. 16.6 to 18.0 million. Exports of industrial chemicals rose slightly from S.Fr. 6.2 to 6.5 million, and perfumery shipments rose from S.Fr. 1.5 to 2.0 million.

The Chemist's Bookshelf

BORON TRIFLUORIDE AND ITS DERIVATIVES. H. S. Booth and D. R. Martin. 1949. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. ix + 315. 40s.

During the past ten years boron trifluoride has found extensive use in many types of organic reactions because of its remarkable qualities as a catalyst; this has led to a vast number of commercial developments and an ever-increasing interest in the compound and its derivatives. For these reasons, therefore, the publication of a treatise on the subject is very welcome, the more so since the authors have presented their material in a lucid manner and have dealt comprehensively with every aspect.

Chapter 1 deals with the interesting historical development of boron trifluoride, and its preparation. The next three chapters delineate the physical and chemical properties of BF_3 and its co-ordinating power. Because it is the most avid compound yet known for accepting electrons there seem to be few chemical substances with which boron trifluoride will not react, though carbon monoxide is an important exception. The inert argon, at low temperatures and under pressure, yields no fewer than six addition compounds with it.

Chapter 4 also discusses the theoretical considerations of the character of the donor atoms in a section entitled "Generalisations on boron trifluoride co-ordination phenomena." The number of different atoms that donate electron pairs to the boron atom is, in fact, surprisingly small, in view of the great many co-ordination compounds formed. In this respect, the treatment at some length of the fluoroborates in chapter 5 is very useful, especially with regard to the section on diazonium fluoroborates, because these compounds afford a convenient means of introducing fluorine into the organic molecule.

Chapter 6, a long one (62 pages) is about one quarter of the textual matter, and deals with the catalytic applications of the boron trifluoride derivatives. That so much space is devoted to this topic is sufficient in itself to indicate the great variety of uses for boron trifluoride in the field of organic synthesis.

The last two chapters give a detailed treatment of the intricate analytical methods used in the detection and estimation of the boron trifluoride compounds and complexes, and discusses the practical handling of these materials. The book is well illustrated; there are many excellent tables and graphs, and the indexes are particularly fine. The text itself is very readable, though possibly a little uncritical, and the authors merit high praise for their inclusion of so much new material in this compact, good-looking and invaluable book.—P.M.

PHYSICAL METHODS IN CHEMICAL ANALYSIS, VOL. I. Edited by Walter G. Berl. 1950, New York: Academic Press, Inc. Pp. xiii + 664. $12.00.

This volume is in effect a series of advanced monographs on selected methods of instrumental analysis. They are written by recognised experts and are intended for the analytical chemist who has to use modern tools. In each case a sound theoretical approach is given, and the monograph then goes on to discuss in detail the practical use of the physical measurement involved and the modern instruments available. In many cases sufficient material is present to enable full use of the particular physical method without much further consultation of specialised literature.

Volume I is concerned with methods which involve the interaction of radiation with matter; in other words, those methods which make use of "light" of any wavelength from that of electrons up to the infra-red. In addition, the mass spectrometer is also considered.

The scope of the work is well indicated by considering the titles of the monographs: Absorption phenomena of X-rays and γ-rays: X-ray diffraction methods applied to powders and metals: X-ray diffraction applied to fibres: Electron diffraction: Spectrophotometry and colorimetry: Emission spectrography: Infra-red spectroscopy: Raman spectra: Polariscopic and polarimetric examination of materials by transmitted light: Refrac-

tive index measurement: Electron microscopy: Mass spectrometry.

The theoretical treatment which opens each monograph is developed to the stage at which all the necessary formulæ and working equations have been derived. The experimental discussion which follows considers modern apparatus and methods; sample treatment and the evaluation of results (wrongly called data!), once these have been obtained; the fields in which the method has been used, in which it has proved particularly useful, and in which it may be applied in the future. Sources of error, the limitations of the method and its accuracy also receive attention. Finally, full literature references are given, as well as a supplementary bibliography of material likely to be of use for familiarisation with the whole field.

Because instrumental methods of analysis have been most extensively developed in the U.S.A., it is to be expected that an advanced treatise of this type from an American source would contain an up-to-date and authoritative treatment of these modern tools and techniques. This expectation is fully realised. In addition, the reader cannot fail to be impressed by the size of the field, and the urgent necessity for monographs of precisely the type contained here. Apart from the intrinsic merit of each monograph, it is very satisfying to have so comprehensive a treatment of these different analytical techniques available under one cover. All analysts whose work involves the use of or dependence on analytical techniques will find it indispensable as a work of reference.—C.W.

PRACTICAL APPLICATIONS OF SPECTRUM ANALYSIS. Herbert Dingle. 1950. London: Chapman & Hall, Ltd. Pp. ix + 245. Plates XIX. 40s.

In this book Professor Dingle aims at presenting the fundamental principles of spectrography. In his opinion, and he has taught the use of the spectrograph for thirty years, quantitative analysis has not yet reached the stage where the methods available are worthy of inclusion in this basic survey. Consequently, the bulk of the book is concerned with the theoretical approach to spectroscopy and the application of the methods to qualitative analysis.

No attempt has been made to describe the most recent apparatus. The author is finally concerned to ensure that the reader will understand the principles sufficiently so as to make use of either simple or elaborate apparatus. It is expected that any competent worker thoroughly familiar with the content of the book should, by use of manufacturers' catalogues and similar information, be able to apply modern apparatus when and where necessary.

The first chapter deals with general principles and presents an elementary discussion of the theory of the production of spectra. In the second chapter, the relative advantages of arc flame, and spark spectra (and the methods of exciting these) are described. There is, in addition, a brief account of absorption spectra. The next two chapters discuss prism and grating spectrographs in general terms, no attempt being made to attach the text to any commercial instrument. A thorough grasp of these valuable chapters should enable the intelligent reader to appreciate the theory underlying the construction of the particular instrument which he is using, and the precautions necessary for its proper use.

Chapter 5 describes the most usual methods for the identification and measurement of the wavelength of spectral lines. Chapter 6 describes the general approach to qualitative analysis, preparation of the sample, choice of exciting agency, identification of the major and minor constituents, and general precautions to be taken. Chapter 7 considers individually the elements which lend themselves to spectrum analysis, including a list of the sensitive lines and the peculiar problems of identification of each element under various conditions.

Although the author does not believe that quantitative analysis is sufficiently advanced at present to receive an extensive treatment, he gives a short introductory account of the problems involved in the use of the spectrograph for this purpose, and mentions one or two of the approaches that have been made to this problem.

The text of the book occupies 130 pages and the remaining 115 pages contain a valuable series of tables. The principal tables are a list of iron arc lines, a list of *raies ultimes* arranged by elements, and a list of *raies ultimes* arranged in order of wavelength. These tables are referred to the plates chosen for illustration purposes.

The title of the book suggests that a very much wider field is covered than is actually the case. The book would be better described as dealing with the "fundamentals of qualitative spectrum analysis." As an introduction to the subject, with no direct reference to the practical instrumental details, it is valuable, and, probably no better introductory book could be recommended, providing a sound basis for more detailed work.—C.W.

Technical Publications

EVERY aspect of instrument technology comes within the scope of the Society of Instrument Technology which has grown rapidly in membership and activity since its inception nearly six years ago. This scope is reflected by the papers published in the current issue of its *Transactions* (Vol. 2, No. 1), which now becomes a quarterly publication. The four papers reproduced are: "Measurement of Short Time Intervals," K. J. Brimley; "The Telerecording of Thickness, Pressure, Flow and other Physical Quantities Using a Simple Electromagnetic Circuit," W. J. Clark; "Modern Permanent Magnets for Electrical Instruments," D. A. Oliver and D. Hadfield; and "Sources of Information Relating to Instruments," G. P. L. Williams.

* * *

INCREASING applications of magnetic technology are reflected in the wide range of equipment for separation, protection, purification, extraction, reclamation, etc., described in its latest publication (No. 117) by Rapid Magnetic Machines, Ltd., Birmingham.

* * *

METHODS of countering corrosion of iron and steelwork in corrosive waters, and preserving of laundry plant are among the main features in the latest issue of "Building Topics" (Vol. IV, No. 4), quarterly publication of Tretol, Ltd.

* * *

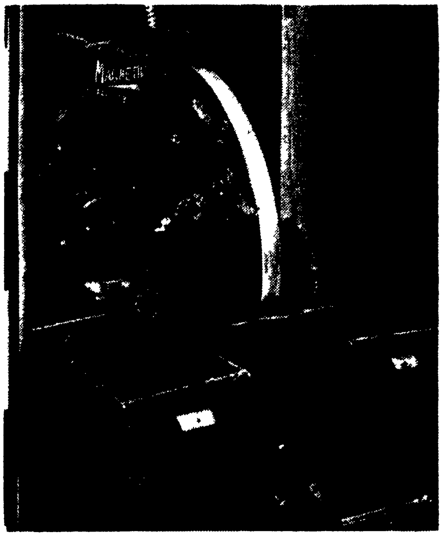
IN RESPONSE to the increasing interest shown, the "Code of Minimum Standards," drawn up by the Retread Manufacturers' Association, has been published in booklet form. The code was originally devised in 1948 as a domestic document to ensure a high standard of craftsmanship.

* * *

GUIDANCE on the design, fabrication and erection of arc welded structural steelwork is contained in its latest memorandum (T.26) now available from the British Welding Research Association.

* * *

TWO new fans for industrial use are described in its latest leaflets by Air Control Installations, Ltd., Ruislip, Middlesex. The Axelaire fan (F.A.508) is designed for extracting stale air, heat, steam, dust or vapours. The Windovent type (F.A.504), specially suitable for window fitting, is provided with a hinged outer cover which closes automatically when the fan is switched off.



[By courtesy of Philips Electrical, Ltd.

Efficient filtration of coolant and lubricating oils is a problem constantly under review in industry where the removal of bulk sludge is essential. This magnet clarifier, designed by Philips, removes not only the bulk sludge but also the smallest ferrous particles suspended in the coolant. The oxidising action due to the presence of such particles is reduced and a saving of coolant effected. Standard clarifiers can handle up to 500 gallons of lubricant or cooling fluid an hour

Aluminium Production in Australia

THE rising cost of rail and sea transport of Australian material may result in reduced use of locally mined aluminium ores. It may ultimately prove more profitable to import the higher grade bauxite ores from abroad.

This was a point made by the chairman of the Australian aluminium production commission in his recent annual report. The commission has suspended its survey of known bauxite deposits in Australia, pending the discovery of new deposits. Proved reserves under control of the commission total 8.6 million tons, of which 0.85 million tons are in Tasmania, and 7.75 million tons in New South Wales, principally in the Invernell and Emmaville districts.

• PERSONAL •

THE following have been admitted as Fellows of the Institute of Chemisty of Ireland: Dr. A. G. G. Leonard; Mr. W. V. Griffiths; Mr. F. T. Riley; Dr. V. Barry; Mr. D. Crowley; Professor T. Dillon; Mr. D. T. Flood; Mr. G. F. O'Sullivan; Professor T. S. Wheeler; Dr. J. C. Aherne; Mr. J. G. Belton; Mr. S. M. de Bheal; Mr. F. J. Coll; Dr. G. Cruess-Callaghan; Mr. P. J. Hurley; Dr. J Keane; Mr. J. Kearns; Dr. A. E. Klingstedt; Dr. G. van der Lee; Mr. J. F. MacErlean; Mr. R. A. Molloy; Dr. B. J. O'Donoghue; Mr. H. L. O'Reilly; Mrs. E. M. Philbin; Professor W. N. Rae; Mr. G. A. C. Wilkin.

Of the four persons elected to fellowships of the Textile Institute three have earned distinction as chemists. They are MR. G. E. KEY, Ripley, Derbyshire, DR. L. A. LICHTENSTEIN, Whitchurch, Glam., and DR. H. F. MARK, Brooklyn, New York. Mr. Key, works chemist, Stevensons (Dyers), Ltd., Ambergate, has made substantial contributions to technical practice in connection with the fixation of dyestuffs on textile fibres; treatments to improve fastness to light of dyed materials, and improved methods of rot-proofing of textile materials. He is a part-time lecturer in textiles at Derby Technical College.

Dr. Lichtenstein, consulting chemist, Treforest Silk Printers, Pontypridd, has been responsible for patents relating to improved methods of dyeing and printing, and is the author of several papers and publications on the subject.

Dr. Mark, director and professor of organic chemistry, Institute of Polymer Research, Brooklyn, is the author of books on the properties of wool and on the physics and chemistry of cellulose. He has lectured to textile societies in England and the U.S.A.

The fourth new Fellow is MR. EDGAR ISLES, Halifax, executive director of the British Cotton and Wool Dyers' Association, an authority on slubbing dyeing.

DR. E. G. MALHERBE, principal of Natal University, has been elected president of the South African Association for the Advancement of Science.

The Pharmaceutical Society's research scholarship of £300 a year for two years has been awarded to MISS B. P. JACKSON, of Thorpe Bay. She will work in the museum of the society on genetical and cultivation investigations of vegetable drugs.

MR. A. D. BONHAM-CARTER is relinquishing the chairmanship of the soap-making firms, John Knight, Ltd., Silvertown, and T. H. Harris & Sons, Ltd., Stratford and Bow, to become head of the personnel division, Lever Brothers and Unilever, Ltd., Unilever House, London. He succeeds MR. H. H. BAGNALL, who has reached retirement age. The new chairman of John Knight, Ltd., and T. H. Harris & Sons, Ltd., will be MR. R. B. LOFTS.

At the recent annual general meeting of the Scientific Instrument Manufacturers' Association the following officers were elected for the year 1950-51:—President: MR. M. H. TAYLOR; vice-presidents: MR. J. E. C. BAILEY and MR. A. W. SMITH; hon. treasurer: MR. S. BORTHWICK; hon. secretary: MR. J. ROCK COOPER.

PROF. T. S. WHEELER, Department of Chemistry, University College, Dublin, is collecting information on the life of a distinguished Irish chemist, William Higgins (1763-1825), who was professor of chemistry to the Royal Dublin Society.

DR. E. W. R. STEACHIE, a leading atomic scientist and chemist, has been appointed by the Canadian Government as vice-president of the National Research Council to co-ordinate all research.

MR. PATRICK GALLAGHER, chairman and a founder of Gallagher Bros., Ltd., tallow melters, West End Chemical Works, Wigan, left £48,037 (net £47,949).

Obituary

DR. STEVAN RUZICKA, who advanced the use of rotary kilns in steel-making in the U.S.A., has died of a heart ailment in Washington, D.C., at the age of 61. He held a number of basic United States patents on wood coke and rotary-kiln processes for the making of high grade steel direct from iron ores.

Visit to Steel Works

About 40 members of the North-Western branch of the Institution of Chemical Engineers visited the Staybrite Works of Firth-Vickers Stainless Steels, Ltd., recently. The party saw the centrifugal casting of heat-resisting steel alloys and the manufacture of pump impellers and other apparatus. Work-hardened materials were seen being returned to the annealing pits. Finally, the strip and sheet mill was visited.

HOME

Fines for River Pollution

Pest Control, Ltd., was fined £20 and ordered to pay 125 guineas costs on each of two summonses this week for causing pollution in the river Riddy, Cambridgeshire.

Eire and Austria Trade Agreement

Chemical and pharmaceutical exports from Austria to Ireland are included in the new trade agreement reported to have been initialled and awaiting final approval of both Governments.

Price Reduction

Evans Medical Supplies, Ltd., has announced that as a result of reduced costs and increased production the price of Heparin, the biological anticoagulant, has been reduced by 25 per cent. Stocks are ample.

Plastics Plant Explosion

One man was killed and another injured by an explosion at the central laboratory of Imperial Chemical Industries general chemicals division, Victoria Road, Widnes, an Monday last. Extensive damage was done to an experimental PTFE plant.

Mexican Trade Agreement

An agreement has been signed by the United Kingdom Government and the Government of Mexico which will allow the importation of Mexican commodities, chiefly raw cotton, worth about £4 million, in the year ending June 30, 1951, provided that normal agreement is reached between buyers and sellers on such questions as price and quality.

Chemical Society Research Fund

Applications for grants from the Chemical Society research fund will be considered in November next and should be submitted on the appropriate form not later than November 1, 1950. Applications from Fellows will receive prior consideration. Forms may be obtained from the general secretary, Burlington House, Piccadilly, London, W.1.

£2 m. for U.S. Pipelines

Dollars to the value of more than £2 million will be received for contracts which have been placed with Stewarts & Lloyds, Ltd., to supply steel pipelines to American petroleum and natural gas organisations. A large part of the work is for the Standard Oil Company, New Jersey, for which the Anglo-American Oil Company has acted as agents.

The Education of the Young Worker

The third conference on "The Education of the Young Worker" will be held at Magdalen College, Oxford, from August 12-18.

Brighton Congress

Brighton will be the location of the Textile Institute's next annual conference, to be held in May, 1951. Progress in important sections of the textile industry during the past century will be reviewed.

New Police Laboratory Planned

The establishment of a forensic science laboratory for the areas of Durham, Northumberland and Cumberland is being discussed by the Home Office and police forces of the three counties.

Laboratory Explosion

An explosion, thought to have been due to a blow-back in a retort, caused serious damage to a laboratory and workshop of Savory and Moore, Ltd., Tottenham, last week. The explosion occurred at lunchtime when only a skeleton staff was on duty, and no one was injured.

Payments to Scottish Pharmacists

The Pharmaceutical General Council has asked Scottish pharmacists to sign a mandate giving the council the right to announce the withdrawal of all chemists from the national health service if no satisfaction is obtained in the dispute with the Secretary of State for Scotland on the question of payments.

Agency to Cease

Business activities of the British Jeffrey-Diamond, Ltd., in South Wales are now being conducted from its own branch office at Dock Chambers, Bute Street, Cardiff (telephone 1070) with Mr. F. Jackson as district technical manager. The agency agreement with Llewellin and Evans and Major, Ltd., was terminated by mutual agreement on July 31.

Sea Water Bromine from Anglesey

The Associated Ethyl Co., Ltd., London, manufacturer of chemicals for petroleum industries, is sponsoring a new industry at Amlwch (Anglesey), a plant to extract bromine from sea water. The plant will take two years to erect and will then employ 120 men. The bromine produced will form part of the company's products for the oil industry, of considerable importance as exports.

ANTI-CORROSIVE PAINTS

Seawater Resistance Tests

RESULTS of tests on the formation of anti-corrosive compositions for ships' bottoms and underwater service on steel are given in the first report of Joint Technical Panel N/P.2, now available from the British Iron and Steel Research Association. The 68 anti-corrosive compositions tested comprised systematic variations of mixtures of basic lead sulphate, white lead, aluminium powder, Burntisland red and barytes. All pigmentations were duplicated in compositions bound, respectively, with a modified phenol formaldehyde / stand oil medium and a coumarone / stand oil medium. In addition, three of the pigmentations were bound with each of five other media, including chlorinated rubber, and media derived from the modified phenolformaldehyde / stand oil by the substitution of dehydrated castor oil or tung oil for part of the stand oil.

Accelerated laboratory tests, using the CRL high-speed rotor were conducted in collaboration by the Chemical Research Laboratory, Teddington, and the Admiralty Metallurgical Laboratory, Emsworth. Eight of the compositions were placed in the "very good" group, all of which appeared to be improvements even upon earlier formulations. The best performances were given by paints bound in chlorinated rubber, which confirmed earlier raft tests at Caernarvon. They were closely followed by a phenol formaldehyde / stand oil / tung oil medium.

Effectiveness of Streptomycin

SATISFACTORY results achieved by the use of streptomycin in the the treatment of tuberculous meningitis have been reported by the Ministry of Health in a recent issue of the *Lancet* reports that analysis of 369 proved cases, the largest yet collected in this country, showed after observation from 10 to 22 months, a recovery rate for the whole series of 28.6 per cent and for early cases as high as 49.3 per cent. Approximately nine out of 10 of the survivors were clinically fit and well. The 104 survivors were under observation for a further year, giving observations varying from 22 to 38 months. All were still alive and 88 were clinically fit and well.

This point was particularly emphasised in the report as " there appears to be a belief prevalent among many medical practitioners that streptomycin treatment does no more than prolong life or produce ' recovery ' as a physical and mental wreck."

LETTER TO THE EDITOR

" Neglected Lime Producers "

I have read with interest the article under the above heading in your publication dated August 5, 1950, and in the main I am fully in agreement with what has been written therein.

It seems to me however, that you do less than justice to the Ministry of Agriculture when you state that " there has been no direct incentive to potential producers to make available more lime or limestone." During the war years the Agricultural Lime Department of the Ministry were very active indeed in encouraging the production of additional agricultural lime and limestone, and in fact subsidies were available towards the capital cost of installing additional plant, and many producers availed themselves of this financial assistance.

I think also, though this is merely an expression of opinion based on general knowledge, that by and large there is adequate production capacity in the country to meet the annual requirements of agricultural lime and limestone, and in addition, to provide a surplus towards overtaking the overall deficiency, so that within a reasonable period of years, the position would be substantially rectified.

In my opinion the greatest needs are,

(a) that limestone producers should be assured as early as possible that the subsidy will be continued on a long term basis,

(b) that farmers should avail themselves fully of existing limestone supplies which are at present in excess of the demands on them,

(c) that supplies should as far as possible, be taken more evenly over the whole calendar year. (In the months of May, June and July the industry is almost at a standstill because farmers cannot, or will not, take supplies of limestone products in those months.)

In my experience, the permitted prices under the subsidy scheme are on the whole fair and reasonable, and I do not agree with the writer of your article that " a subsidy which was intended to encourage lime consumption in the national interest of land fertility has, in fact, discouraged production."

The production is, in the main, available although there may be certain parts of the country where additional supplies are required.—Yours, etc.,

HAROLD FLETCHER,
Assistant Managing Director.
Derbyshire Stone, Ltd.,
Matlock.

The Stock and Chemical Markets

THERE has been a firmer tendency in stock markets, and prices generally rallied moderately, led by British Funds, which were helped by the success of the Sierra Leone issue, although best levels have not been fully held. Uncertainty as to how and when additional taxation to pay for rearmament will be applied tended to keep industrial shares in the background, but there were numerous moderate gains, and a fair business was again reported in the steel and armament sections.

Chemical and kindred shares have reflected the better tendency in markets, although generally movements have been small. Further consideration of the good financial results and share bonus put British Glues 4s. units higher again at 25s. 9½d. Imperial Chemical strengthened to 41s. 3d., Monsanto were firmer at 48s. 6d. Laporte Chemicals 5s. units were 10s. 3d., Burt Boulton 26s. 6d., and Fisons 25s. 9d. Boake Roberts at 28s. 9d. have further responded to the past year's good profits. Albright & Wilson 5s. units at 29s. 6d. kept steady, the market awaiting news of the company's decision whether more capital is to be raised at this stage.

Brotherton 10s. shares remained at 20s., Bowman Chemical 4s. units were 5s. 3d., F. W. Berk 10s. 3d., Amber Chemicals 2s. shares 3s. and Lawes Chemical 10s. 3d. L. B. Holliday 4½ per cent preference were 19s. 6d. and British Chemical & Biologicals 4 per cent preference 19s. 6d. Woolley 4¾ per cent debentures were 104½ Pest Control 5s. shares eased to 6s. 9d.; the 5 per cent preference were 18s. 6d., at which there is a yield of over 5⅝ per cent.

Turner & Newall have firmed up to 80s. and United Molasses to 42s. 6d. The 4s. units of the Distillers Co. were 18s. 6d. and United Glass Bottle at 75s. were again a particularly firm feature. Triplex Glass at 23s. 9d. have rebounded in anticipation of the results, the market expecting good profits although still being doubtful if it will be decided to raise the dividend at this stage.

Glaxo Laboratories have eased to 45s. 9d., Boots Drug showed firmness at 47s. 6d. and Borax Consolidated deferred were 54s. 6d. British Xylonite at 72s. 6d. failed to recover from their recent reaction. De La Rue were firmer at 28s. 3d., British Industrial Plastics 2s. shares were 5s. 3d. and Kleemann 1s. shares 7s. 7½d. Lever & Unilever, after falling to close on 38s., have picked up to 39s., the market assuming that there will be preferential allotment terms for shareholders in any new issue. Lever N.V. improved to 39s. 3d.

Iron and steels were again prominent with further gains, although best levels were not always held. Dorman Long have risen further to 32s. 3d., Colvilles to 36s. 9d., John Summers to 31s. 1½d. and Guest Keen to 46s. 9d. Staveley were 78s. 3d. and Powell Duffryn 29s. 4½d.

Sangers receded a little to 21s. 9d. Beechams deferred showed steadiness at 12s. 6d. Griffiths Hughes were 21s. 6d. and British Drug Houses 5s. shares changed hands around 7s. Associated Cement at 82s. 6d. regained part of an earlier reaction. Paint shares were generally better, with Lewis Berger at 27s. 3d., Goodlass Wall 34s. and Pinchin Johnson 37s. 9d. Oils also reflected the improved trend of markets.

Market Reports

A STEADY trade has been maintained in most sections of the industrial chemicals market, the usual seasonal quietness being offset by a greater activity in contract business. Supplies in general appear to be adequate to meet the immediate pressure from the home consuming industries and to cover a good volume of overseas inquiry. Prices have moved within narrow limits and, with the exception of a higher price for glycerin, there have not been any changes of importance. The uncertain world conditions are widening the market for the coal tar products.

MANCHESTER.—Seasonal influences on the Manchester market for heavy chemical products during the past week have been strongly in evidence. There has been a fair contract movement of the alkalis and other leading products to home users, but it has not been so heavy as it was a month or so ago. New bookings have also been on a smaller scale. With the holiday season now passing its peak, however, a return to normal activity in the market may be looked for within the next few weeks. Shipments of chemicals to the Empire and other overseas outlets has been on a moderate level. Average sales have again been reported in the fertiliser section. In the tar products market the light distillates generally seem to be attracting most attention.

GLASGOW.—Business generally continues to improve in the Scottish heavy chemical market. Exports also show improvement.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ABARDALE MANUFACTURING CO., LTD., London, W., wax mfrs. (M., 12/8/50.) July 7, £6000 second deb., to Mrs. H. M. Leapman, Hove; general charge.

ABBEY PLATING WORKS, LTD., Wembley. (M., 12/8/59.) July 6, £2650 mort. and a further charge collaterally securing £2650 secured by above mort. until such sum has been reduced to £1150, to Westbourne Park Building Soc.; respectively charged on Rowland Avenue, Kenton, and land and buildings, Abbey Plating Works, Wycombe Road, Wembley. *£13,916. Oct. 14, 1948.

EVERSON MOULDINGS, LTD., London, E., plastic moulders. (M., 12/8/50.) July 7, deb., to A. Brooks, East Barnet, securing such sum as may at any time be due to the holder; general charge.

FIDELITY INSTRUMENT CO., LTD., London, S.W., scientific instrument mfrs., etc. (M., 12/8/50.) July 6, series of £3000 debs., present issue £2700; general charge (subject to etc.).

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 12/8/50.) July 10, £500 debs., part of a series already reg. *Nil. July 22, 1949.

MANBRE & GARTON, LTD., London, W., mfrs. of brewing sugars, etc. (M., 12/8/50.) July 5, £50,000 deb. stock, part of an amount already reg. *£573,744. Mar. 24, 1949.

Company News

Morgan Crucible Co., Ltd.

Group profit of the Morgan Crucible Co., Ltd., for the year ended March 31, 1950, allowing for all charges but before tax, was £1,135,046 compared with £1,195,109 in the preceding year. A final ordinary dividend of 8¾ per cent enabled the payment again of 12½ per cent on the year.

Standard Chemical's Profits

The Standard Chemical Co., Ltd., Montreal, earned $940,473, during the year ended March 31, 1950, an increase of 66.7 per cent on 1949. Though selling prices were little increased, the dollar value of sales was the highest in the company's history. The net profit for the year was $685,218.

New Registrations

Chemurgy, Ltd.

Private company. (27,832). Capital £20,000. Harvesting and collection of seaweed, etc. Reg. office: 135 Buchanan Street, Glasgow.

Flygiene, Ltd.

Private company. (484,743). Capital £500. Manufacturers of insecticides, fumigants, chemicals, etc. Directors: L. Butler, S. R. Butler. Reg. office: 90 Queen Street, E.C.4.

Ferdix Rubber (London), Ltd.

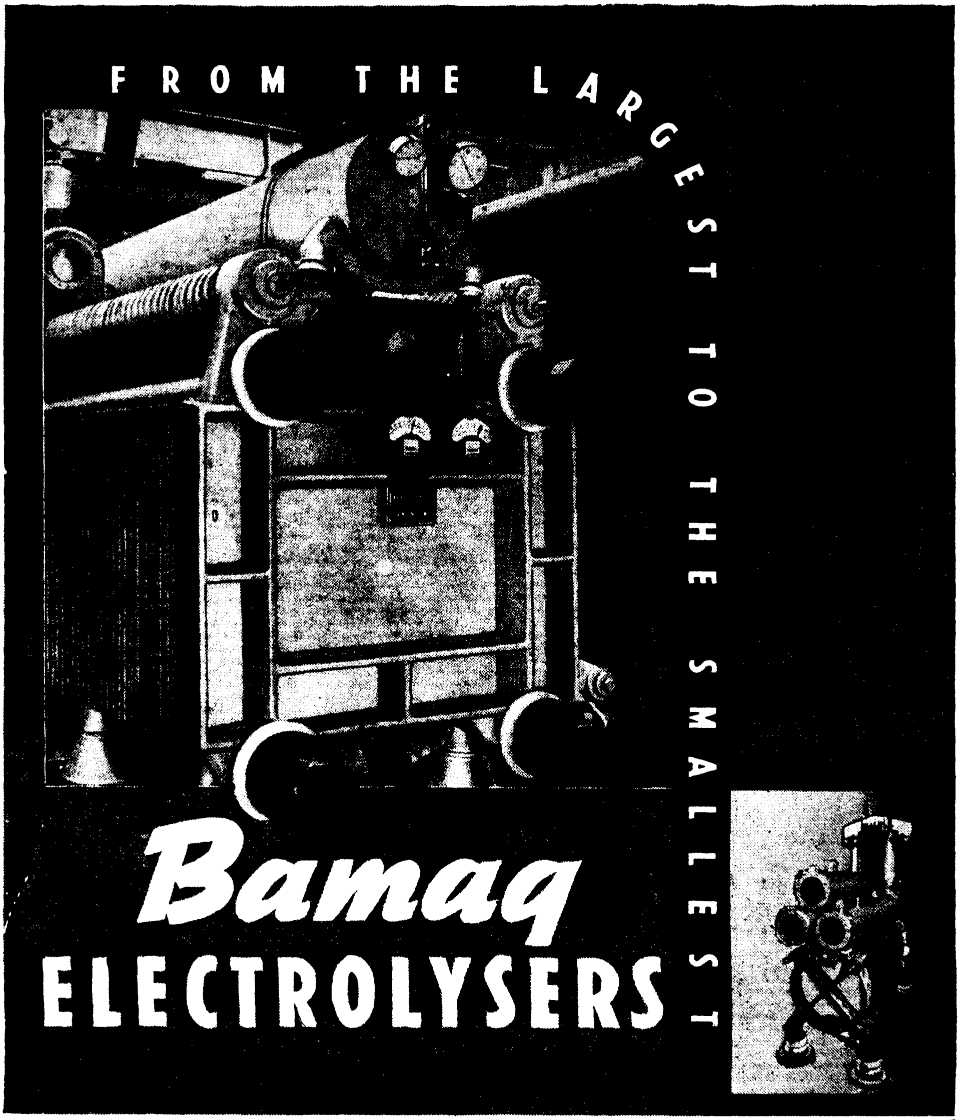
Private company. (484,004). Capital £100. Import and export of crude, synthetic and waste rubber, rubber chemicals, plastic and similar materials, etc. Reg. office: Bridgeway House, Hammersmith Bridge Road, W.6.

Paul Wormser & Co., Ltd.

Private company. (484,717). Capital £100. Manufacturers of heavy chemicals, etc. Reg. office: 203 Regent Street, W.1.

Swiss Chemical Exports

The value of chemicals, pharmaceuticals, dyestuffs and perfumery exported from Switzerland during the first six months of this year amounted (in million Swiss francs) to 238.7, compared with 239.9 and 264.5 in the first and second half, respectively, of 1949. The leading position is occupied by pharmaceuticals with 100.1 (93.2 and 103.1), followed closely by dyestuffs with 93.7 (100.4 and 111.8). Shipments of industrial chemicals totalled 34.6 (34.3 and 36.2) and of perfumery 10.3 (12.0 and 18.4).


FROM THE LARGEST TO THE SMALLEST
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B2071-CI

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Process of purifying aromatic 1-hydroxy-2-acid amides by conversion into aromatic oxazine diones and reconversion of the said diones to purified amides.—General Aniline & Film Corporation. July 3 1947. 642,412.

Stabilisation of soap.—Monsanto Chemical Co. July 8 1947. 642,596.

Creep and corrosion resistant alloys.—Blaw-Knox Co. July 10 1947. 642,669.

Production of sulphonamides.—Monsanto Chemical Co. July 10 1947. 642,597.

Modified rosin esters and compositions containing them.—Montclair Research Corporation. July 21 1947. 642,414.

Vinyl halide polymers and copolymers and method of producing same.—B. F. Goodrich Co. July 22 1947. 642,415.

Diazotype compositions containing N-hydroxyethyl m-toluidine P-diazonium compounds.—General Aniline & Film Corporation. Sept. 19 1947. 642,422.

Butadiene copolymers.—H. K. Stephens, J. Downing and J. G. Drewitt. Nov. 19 1948. 642,606.

Containers for storing and dispensing liquefied gases.—British Oxygen Co., Ltd., and R. C. Godfrey. Nov. 9 1948. 642,438.

Process of recovering potassium from diluted solutions.—Norsk Hydro-Elektrisk Kvaelstof-Aktieselskab. Dec. 9 1947. 642,472.

Wax-coating compositions.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Dec. 12 1947. 642,441.

Method of inhibiting polymerisation.—Mathieson Alkali Works. Jan. 26, 1948. 642,612.

Process for the manufacture of urethanes.—Beck, Koller, & Co. (England), Ltd. Feb. 5, 1948. 642,453.

Manufacture of carbon bisulphide.—Dow Chemical Co. Feb. 16, 1948. 642,557.

Process for obtaining an organic product containing nitrogen sulphur and oxygen and its application as a vulcanisation accelerator.—Soc. Anon. de Matieres Colorantes et Produits Chimiques Francolor. Feb. 26, 1948. 642,618.

Preparation of organo antimony derivatives.—Soc. Des Usines Chimiques Rhone-Poulenc. May 31, 1948. 642,457.

Process for the production of dimethyl silicon dichloride.—Dow Corning Corporation. June 16, 1948. 642,680.

Production of chlorbutyl esters of carboxylic acids.—British Celanese, Ltd. June 24, 1948. 642,489.

Organic oxidation reactions.—Imperial Chemical Industries, Ltd., and R. L. McGinty. June 20, 1949. 642,459.

Distillation of aluminium from aluminium alloys.—International Alloys, Ltd., and E. Scheuer. Aug. 2, 1949. 642,499.

Organic sulphur derivatives.—Ilford, Ltd., and H. D. Edwards. Sept. 14, 1949. 642,514.

Phosphors.—Marconi's Wireless Telegraph Co., Ltd. Nov. 14 1944. 642,701.

Method and apparatus for making a fabricated sheet of unspun fibres.—Fibre Products Laboratories, Inc. July 15 1946. 642,890.

Moisture-resistant coating and method of producing it.—Western Electric Co., Inc. Aug. 1 1946. 642,892.

Process for the production of sterols from oils, fats and fatty acids.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Nov. 20 1946. 642,714.

Process for the manufacture of fatty acids of high melting point from waste fatty substances.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Nov. 20 1946. 642,715.

Method for the extraction of nucleic acid.—M. A. E. Assada. Nov. 26 1946. 642,716.

Production of alumina.—Aluminium Laboratories, Ltd. Jan. 2 1947. 642,943.

Method of pyrogenetically treating a mixture of combustible and non-combustible material and a furnace therefor.—J. E. Greenwalt. Jan. 8 1947. 642,898.

Process for the esterification of fatty acids with low-molecular univalent alcohols.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Jan. 16 1947. 642,718.

Glassy phosphate powder compositions and process of making the same.—Albright & Wilson, Ltd. Feb. 28 1947. 642,944.

Glassy phosphate powder compositions and process of making the same.—Albright & Wilson, Ltd. Feb. 28 1947. 642,945.

Gas analysers.—C. A. Parsons & Co., Ltd., and A. E. Martin. Jan. 28 1948. 642,725.

Manufacture of isopropyl alcohol.—Distillers Co., Ltd., J. Howlett, and W. L. Wood. April 1 1948. 642,905.

Process for the conversion to sulphur and/or sulphur dioxide of other sulphur compounds and catalysts therefor.—K. Williams. April 9 1947. 642,726.

Manufacture of moulded articles from materials containing cold-swelling starch. —Naamlooze Vennootschap W. A. Scholten's Chemische Fabrieken. April 14 1947. 642,906.

Method of removing chlorate substances from alkali metal hydroxides.—Diamond Alkali Co. April 15 1947. 642,946.

Sulfonated 1, 3-di (nitrophenyl) triazenes.—General Aniline & Film Corporation. April 16 1947. 642,947.

Process and apparatus for the cooling of molten lubricating greases.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 2 1946. 642,948.

Manufacture of coloured photographic layers.—Gevaert Photo-Producten N. V. May 13 1947. 642,728.

Process for preparing benzodioxane derivatives and the product resulting therefrom.—A. H. Stevens (Monsanto Chemical Co.) May 20 1947. 642,949.

Packages for use in liquid purification. —American Cyanamid Co. May 28 1947. 642,732.

Process for the preparation of alkanolamines.—Soc. Carbochimique Soc. Anon. June 25 1947. 642,950.

Processes of producing condensation products of phenols and processes of preserving rubber.—Monsanto Chemical Co. July 10 1947. 642,827.

Process for the removal of silica from an aqueous fluid.—American Cyanamid Co. July 30 1947. 642,951.

Soapless detergents mixed with triphosphates as builders.—Procter & Gamble Co. Aug. 1 1947. 642,921.

Luminescent materials.—Sylvania Electric Products, Inc. Aug. 5 1947. 642,742.

Convertable alkyl resins.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 26 1947. 642,828.

Porous pots for primary electric cells.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd., Hawley Products, Ltd., W. W. Puffet, and A. Lewin. Aug. 30 1948. 642,744.

Filter for purifying a liquid or gaseous fluid.—J. Depallens. Sept. 9 1947. 642,748.

Process for preparing reaction products of natural rubber or synthetic rubber-like materials with sulphur dioxide.—Rubber-Stichting. Oct. 3 1947. 642,959.

Lubricating composition.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 6 1947. 642,960.

Infra-red gas analysing apparatus.—C. A. Parsons & Co., Ltd., and A. E. Martin. Oct. 6 1948. 642,750.

Continuous bleaching of glyceride oils.—Procter & Gamble Co. Oct. 16 1947. 642,751.

Method of producing pinacols.—White Laboratories, Inc. Oct. 24 1947. 642,752.

Process for the manufacture of olefine oxides.—R. S. Aries. Oct. 28 1947. 642,961.

Repeatedly ignitible composition rods.—F. K. Knutsson-Hall. Nov. 7 1947. 642,754.

Preparation of acetals.—General Aniline & Film Corporation. Dec. 8 1947. 642,880.

Process of brazing austenitic ferrous metals and articles produced thereby.—Ford Motor Co., Ltd. Dec. 18 1947. 642,768.

Stabilisation of tetrahydrofuran.—E. I. Du Pont De Nemours & Co. Dec. 19 1947. 642,969.

Refining of oils and motor fuels.—Refiners, Ltd., and T. Scott. Nov. 29 1948. 642,772.

Process for the production of a catalyst. —Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. Dec. 23 1947. 642,970.

Process for preparing metal powders for the purposes of powder metallurgy from copper and iron containing ores.—D. Primavesi. Dec. 29 1947. 642,773.

Nitriles and method of preparing same. —Resinous Products & Chemical Co. Jan. 1 1948. 642,930.

Apparatus for and method of applying protective coating material to the inside of a pipe or the like.—Dearborn Chemical Co. Jan. 8 1948. 642,777.

Production of potentially heat reactive thermo-setting resins and infusible resins and resinous products obtainable therefrom.—Harvel Research Corporation. Jan. 20 1948. 642,780.

Retardation of development of reversion flavour in hydrogenated fats and oils.—Procter & Gamble Co. Feb. 7 1948. 642,977.

Amides and their sulphonated derivatives.—Nopco Chemical Co. Feb. 13 1948. 642,836.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond, G. G. Durrant, and R. J. Wigginton. Dec. 15 1946. 642,979.

Process for printing or dyeing superpolyamide fibres.—Ciba, Ltd. Feb. 20 1948. 642,837.

Process and apparatus for the manufacture of fertilisers.—J. Balfour & Co., Ltd., J. H. Balfour, W. R. Normand, and A. M. Cameron. March 3 1949. 642,795.

Polymerisation of 4-vinylcyclohexene dioxide. — Canadian Industries, Ltd. March 24 1948. 642,799.

Polymeric 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. March 24 1948. 642,800.

Polymerisation of 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. April 14 1948. 642,983.

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Protecting Chemical Industries

WITHIN the last few days a London firm of polish manufacturers whose interests run hand in hand with those of many chemical industries has brought off the equivalent of what in war would be the taking of a heavily defended position. It is reported to have induced one buyer at the Chicago fair to undertake to buy $1 million worth of its products within the next 12 months and another to contract to provide 100,000 Canadian dollars for supplies for the other half of the North American market. Transatlantic business on this scale overtops even the kind of achievement which the economic "trainers" of Sir Stafford Cripps's school have regarded as the appropriate target for British industries in America. Could it be secured by other producers, and especially by other industries on a reasonably widespread scale, the "dollar problem", which at the moment is withholding some most important supplies from the chemical industries and others, would soon be no more serious an impediment to trading with America than are the repercussions of the Boston Tea Party to-day.

That roseate prospect is marred, so far as chemical industries are concerned, by the rigid maintenance in the U.S.A. of a high and heavily buttressed tariff wall behind which their chemical industries have grown so abundantly that some of them have become a source of political embarrassment and the target for the sharp darts of the Anti-Trust Commission bandolieros. Whatever charges the attackers have been able to present against the great groups such as the Du Pont de Nemours complex of chemical and chemical and steel using industries none, however, has been able to belittle their most evident success or the impetus they have added to the forces that have raised American economy and living standards to almost dizzy heights.

The bastion which has so successfully held off the invaders is deeply rooted in American policy. The foundations of much of it were laid in the 1920's when the U.S.A., like the United Kingdom, was ruefully counting the cost of having entered a world war which was largely dominated by chemicals and steel with great gaps in her capacity to produce the former. The reaction in this country is commemorated to-day by what remains of the Key Industries Duties schedule, which, unlike the U.S. tariff wall, has never been sacro-

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

sanct when reciprocal arrangements to widen the bases of world trade have been the objective.

Much more is going to be said about that desirable objective—of throwing open more markets—when 18 nations assemble their trade representatives at Torquay this autumn with the intention of negotiating freer trading arrangements by reciprocal adjustments of trade and tariff agreements. It will be very surprising if that conference does not produce some demands for a number of fresh entry ports through the relatively slender defences of British chemical industry. The U.S.A., notwithstanding its unique capacity to offer wanted chemical shipments, will not be the foremost in the list of applicants. American chemical manufacturers have no illusions about their capacity to compete on a price basis in the sort of materials which we can produce ourselves. Their own estimate of comparative wage rates in dollars against devalued pounds leaves little room for doubt on that point. The average wage of a Dow Chemical Company worker, it is said, is about 360 per cent of the wage paid in a British competing industry. British wages are higher than almost any others in Europe and a large influential section of American opinion, in which the powerful trades unions join hands for once with managements, has the firmest determination not to permit the starting of a price (and wage) cutting campaign.

Any who believe that the American attitude at the Torquay conference in respect of chemicals will be distinguished by the liberality which has characterised most of their President's foreign policy can have paid no regard to what American chemical opinion says about this. The Washington Government committee concerned with the Reciprocal Trade Act, which recently invited chemical manufacturers' views on the subject of tariff remission, was left in no doubt. Faced with suggested tariff reductions which would include some 200 chemicals of the type made by the Dow Company, the leaders (of Dow, U.S. Industrial Chemicals and the Monsanto Chemical Company among others) have presented a rebutting case which even President Truman's prerogative to cut U.S. tariffs by half probably dare not overrule. It foresees such things as American phenol manufacturers driven out of production, unemployment, the curtailment of research and develop-

(*continued on page* 248)

Notes and Comments

Industry and Rearmament

UNEASY recollections of industrial rearrangements of a decade ago, when chemical plants were among the first to subordinate their commercial programmes to supply the needs of national defence, have been revived this week by the knowledge that preliminary talks on industry's contribution to defence have been taking place between the Government and the chief employers' federations, such as the Federation of British Industries. Memories of shadow factories, the re-tooling of peaceful works for war equipment and the rest cannot be entirely banished in the light of the evident necessity for a measure of rearmament, the magnitude of which at present remains a secret of which presumably only the Cabinet and the Treasury know the answer.

Artificial Scarcities

THIS is clearly the moment when perhaps the most serious danger to the normal functioning of chemical industry and the multitude which depend upon, it is not so much that a rearmament programme might make large abnormal demands as the temptation to over-purchase in some directions in fear of future shortages. In countries where famine is almost of routine recurrence it is well recognised that calamity is bred as much by the automatic hoarding by the few as by the actual shortfall in food supplies. It is to be hoped that no one now will discern an emergency where none exists. Should large-scale re-armament in fact prove necessary British industries would on this occasion not have to bear the burden without the formidable aid of American industries. And the eventuality, it is well to remember, is still only a hypothetical one.

PRO for U.S. Chemicals

CHEMICALS—in the widest connotation of the word—now represent one of the largest sectors of industry in the U.S.A. As awareness of that spreads those who direct the leading component groups are becoming increasingly conscious of the need to give a responsible account of what goes on to those outside. Even colossi, it seems, do not despise public relations officers. The most recent evidence of that is the decision of the U.S. Manufacturing Chemists' Association to entrust to an expert spokesman, Robert L. Taylor (editor of *Chemical Industries*), the rôle of interpreter of manufacturing achievements and objectives to the rest of America. That decision contrasts strangely with the extreme reticence which still distinguishes most branches of chemical industry in this country. The American reasons for wanting to state their case, as presented by the president of the Monsanto Chemical Company, Mr. William M. Rand, deserve a wider hearing than the MCA membership. "There has never been greater need for the chemical industry—as an industry—to tell its story to the public and to Government," says Mr. Rand. "Many in high places apparently do not understand what the chemical industry is, what its record has been, and what promise—under a free economy—it holds out to our nation. Our facts must be brought home forcefully and frequently to persons outside our industry—whether in Government or labour or any other activity."

Leadership in Atomic Research

AS a timely antidote to the propaganda which the "Kremlin countries" feverishly disseminate to identify the U.S.A. as the atomic warmonger the eighth semi-annual report of the American Atomic Energy Commission deserves wide distribution—much wider in fact than it seems likely to get. It recalls two highly relevant facts: the rapid multiplication in America of peaceful advances in the uses of atomic energy, and the absence of a report of any kind on the work which is known to be in progress in Russia. The American report, which reviews most of the significant facts

since the production of fissionable material on a large scale began, does not attempt to disguise that, in accordance with President Truman's directive, work has continued on all forms of weapons, including the hydrogen bomb. Of the need for that current events are unfortunately providing all the testimony needed. The important thing is that the West has never lost sight of the ultimate objective—the scientific control of nuclear energy for peaceful ends. Two experimental reactors of new design for research recently reached the construction stage; the production and distribution of radioisotopes and stable isotopes to improve health, food production and a multitude of industrial techniques continue to grow. (There was a 36 per cent increase in distribution on the preceding half-year). The opening in May of the Oak Ridge Institute of Nuclear Studies, for the treatment of malignant diseases—particularly cancer—with short-life radioisotopes, is further proof of good faith. In industry it is the same story. Little of technological use is being withheld by the AEC and to that a long appendix of new patents in the report and the finding of an investigating committee testify. Meanwhile the costs of basic research remain high in comparison with the immediate material benefits set against them; in the fiscal year 1950 research contracts in physical sciences supported directly by the AEC will have cost $10.1 million, and in biology and medicine $7.8 million.

A Costly Export

THE news that Dr. Hubert Martin, of the Long Ashton Research Station, has just sailed for Canada to take the lead in Canada's insecticide and fungicide research is good news for Canada. It is very far from being good news here. It appears to indicate that Britain has been unable to keep a scientist who has been for many years a pioneer of chemical crop protection and whose work and authority appear to have been recognised more fully in America than at home. In Canada he will be in charge of the Government's new research department for insecticides and fungicides, the first in the world of that specialised kind. The gratification that Canada, in starting such an enterprise, should have turned to Britain rather than to America for the man to establish it is rather inadequate consolation. At a farewell gathering at Long Ashton Research Station last week Dr. Martin said that he had tried in vain to persuade the authorities here that we need facilities for similar research in this country. The situation invites speculation about what would have been said had Hobbs, in the prime of his career, departed for Australia because he had come to the conclusion that conditions in this country were not conducive to good cricket. The analogy is not as remote as it may sound. This loss of an outstanding scientist must be sustained at a time when his subject is more important and more complex than ever before. Since the war, there has been a succession of white papers and reports stressing the urgent need to widen and encourage British research facilities. Dr. Martin's departure is a dismal comment upon all these good intentions and bold promises.

PROTECTING CHEMICAL INDUSTRIES

(*continued from page* 246)

ment and the crippling of American defences. The last is a trump card at the moment.

Is the Board of Trade, which has now to study the possibilities of further concessions in our own chemical market, aware of the uncompromising stand which the American industries are taking about their own participation in this policy? That is one of the questions to which, in present circumstances, few people here can provide an answer. Trade federations, said the Board this week, are given ample opportunity to present the view of British chemical manufacturers. And there is nothing to prevent an individual manufacturer independently presenting his case. But here, unlike the U.S.A., all this is very much *in camera*.

CHLOROMYCETIN IN U.K.

U.S. Company Coming to Hounslow

PLANT for the production of pharmaceuticals, particularly chloromycetin, is to be erected by Parke, Davis & Company, at Hounslow, Middlesex.

Under the contract made with the Economic Co-operation Administration, the American firm will be able to convert into dollars up to $735,000 of its possible sterling receipts from its new investment in this country. The sum guaranteed covers the original investment of $420,000, plus possible earnings up to $315,000. Assets to be invested include cash, machinery, and equipment.

Approval of the investment has been given by the U.K. Government and the ECA has authorised the guarantee of convertibility as one of the means of encouraging the flow of American capital to finance recovery projects in western Europe.

This scheme is the twelfth ECA guarantee covering the new investment of an American company in the United Kingdom.

Overseas Trade in July

THE provisional value of exports in the 26 working days of July was £182.0 million compared with £175.8 million in the 25 days of June. (The latter figure, on a 26-day basis, was £182.9 million, the highest on record.) Exports in the second quarter averaged £169.4 million.

The provisional value of imports in July, £225.3 million, was roughly the same as the high level reached in the second quarter (£225.2 million a month) and was £38.4 million more than in July last year.

With re-exports at £6.2 million, the excess of imports over exports and re-exports (valued f.o.b.) was £37.2 million, making the adverse balance so far this year £256.9 million, compared with £239.0 million in the corresponding period of last year.

Leather Chemists' Conference

THE annual conference of the Society of Leather Trades' Chemists is to be held in the large chemistry lecture theatre, Leeds University, on September 22 and 23. Professor E. K. Rideal is to deliver the fourth Procter Memorial Lecture—on "Membrane Permeability." The presidential address will be given by Mr. G. Jessup Cutbush. The annual dinner will be held on September 22.

BRITISH SILICONE PROJECT

Lesser Dependence on U.S. Sources

THE prospect of creating a new range of British chemical materials of exceptional interest for the home and export markets was indicated in the recent announcement that Albright & Wilson, Ltd., is to make silicone products.

As agent here for the Dow Corning Corporation of America, Albright & Wilson has been the supplier for four years of a gradually increasing range of silicone materials for industry, such as heat and water resisting compounds, greases, inert liquids and foam inhibitors, resins and varnishes and Silastic rubber, all characterised by their extremely high resistance to destructive conditions. It is believed that virtually all these would have formed much more widespread use in chemical and some other industries had not dollar shortage precluded their distribution on that scale.

The company has started to equip premises at the Oldbury factory to produce all the materials which have hitherto been imported and some others. In the latter category are some of the special compounds which are particularly useful in facilitating easy release of moulds.

Because the type of plant required to originate organic silicon materials is unlike almost all existing chemical plant, it is thought unlikely that the new department at Oldham will start production in less than two years.

Several other chemical companies are known to have been engaged for some time past on laboratory investigation of the possibilities for the commercial production of silicone substances. Albright & Wilson's is the first production plan to have been announced.

Explosives in Cargo Ships

THE carriage of explosives and conditions of stowing in cargo ships are the subject of a revised list of instructions issued by the Ministry of Transport.

The circular (No. 1817(T.152) Amendment No. 1), is for the information of ship surveyors, shipowners, shipmasters and shippers and is an interim measure pending the publication of the report of the departmental committee on the carriage of dangerous goods and explosives in ships.

The revised list, dated May 1950, has no relationship with the explosion in the British steamer *Enterprise* in the Red Sea on June 19 or with the explosion on a naval ammunition barge on July 14.

ARDIL PROGRESS

Dumfries Factory Nearly Completed

THE prospect that Ardil, the synthetic fibre suitable for clothing and other textiles, will be commercially available before long is brought nearer by the news that construction at the factory being raised for the purpose at the I.C.I., Ltd., Nobel Division at Dumfries, has reached the stage to permit the installation of spinning machinery.

The project is dealt with in the August *I.C.I. Magazine*. Mr. J. E. Braham, the engineering controller, announces that very satisfactory progress continues to be made with the erection of the buildings. Work on the site was begun in April, 1949, and today, little more than a year later, all buildings, except that in which the actual spinning operations will be performed, are nearly finished.

Attractive-looking Factory

Much thought has been given to the design of all the buildings from the point of view of functional requirements, working conditions and external appearance. The finished factory should prove a striking example of how industrial buildings can be made attractive. The use of buff-coloured bricks for the outside walls gives a very pleasing effect.

Buildings with multiple vaulted roofs are, with the exception of the use of brick for facing purposes, constructed of reinforced concrete. They are the first of their kind to be built in Scotland. A changeover was made to concrete after work on the site had actually started, as the steel-framed construction originally intended was being seriously delayed by late deliveries of fabricated steel. This change may have saved as much as six months.

Apart from delays in structural steelwork, there have naturally been other difficulties with which to contend, one of which may be of interest. During site-levelling operations a small area of ground with very poor load-bearing properties was detected, and as this area was the site of the heavy tower building it had to be made good by driving nearly 300 20-ft. long piles.

The stage has now been reached at which civil engineering and building work is giving place to the installation of plant. It is planned to have sufficient plant and equipment in position by February 1951 to start production with about one-quarter of factory capacity.

To achieve this will be no easy task; but as a result of early ordering of long-

(*continued at foot of next column*)

delivery items, their availability when required should be assured. In fact, very large quantities of electric motors, pumps, gearboxes, valves, and piping of various materials, including steel, copper, lead, polythene and many other items, are already at Dumfries, housed temporarily in the large store building lying behind the tower building.

This store has been constructed for the raw material derived from groundnuts from which the Ardil fibre will be produced, as well as for the only by-product of the process, a meal which will be sold as an animal foodstuff.

CONTRACT ACHIEVEMENTS

$1 M. Order from Chicago

A CONTRACT to supply $1 million worth of British made domestic polishes has been awarded to the Furmoto Chemical Company, Ltd., of London, by Modern Chemicals, of Chicago, Illinois. A report from New York states that a Toronto company has also contracted with the company for polishes to the value of $100,000. The signing of this large contract was one of the noteworthy features of the opening week at the first U.S. International Trade Fair, and recalls the considerable progress made by Furmoto in their 26 years' operations in this country. During this period 64 gold medals have been awarded to the company's products at exhibitions all over the world.

£2 M. for Coal Plant

THE chemical engineering firm of Simon-Carves, Ltd., Cheadle Heath, Stockport, has secured a £2 million contract for new coal preparation plant for a group of Turkish mines. The order was booked in competition with American, Belgian, French and German firms.

The work, which is expected to take about two years to complete, is to include two complete washeries, which will be among the largest of their kind in the world. These will be located at Zonguldak and Catalagzi on the southern shore of the Black Sea. One will have the capacity to treat 750 tons per hour run of mined coal and the other 500 tons per hour.

Competition for Engineering Works

Three American engineering firms, as well as British ones, have applied to the Board of Trade for permission to take over the engineering works at Clayton-le-Moors, near Accrington, which will be vacated by Courtaulds, Ltd., at the end of this year.

STEEL OUTPUT MAINTAINED

July Production a Record

THE largest output of steel ever recorded in the month of July was attained last month when production reached an annual rate of 14.366 million tons, despite the effect of the summer holidays. The previous highest July figure was 13.145 million tons in 1940.

Production in the first seven months of this year has been running at an annual rate of over 16.5 million tons, compared with 16.0 million tons last year and an actual total of 13.25 million tons in 1939. Post-war development plans are now more than half completed and it is anticipated that the industry will be able to produce at a rate of 17.25 million tons by 1953.

The industry, according to the Iron and Steel Federation, is in a strong position to meet the impact of a re-armament programme. Among new plants which recently came into operation was a new furnace at Consett with a potential of 225,000 tons of pig iron a year, and two new open hearth furnaces at Colvilles with an eventual capacity of 168,000 tons of ingots annually.

Good Stock Position

Stocks of steel are good, having been increased since 1948 by approximately 800,000 tons. These could be reduced without danger to meet any temporary shortages.

Scrap supplies are likely to represent a problem, as the large quantities which have been received from Germany are unlikely to be maintained at the same annual rate.

In May, the industry decided not to pass on to consumers the increase in costs (about 10s. a ton of finished steel) due to higher transport charges. The rise in price of raw materials, however, is causing some concern.

Details of July production figures issued by the Iron and Steel Federation were:—

STEEL INGOTS AND CASTINGS

Tons

	1949		1950	
	Weekly average	Annual rate	Weekly average	Annual rate
1st ½-year	305,700	15,897,000	319,600	16,619,000
June ..	300,900	15,645,000	312,500	16,249,000
July ..	244,200	12,697,000	276,300	14,366,000

PIG-IRON

Tons

	1949		1950	
	Weekly average	Annual rate	Weekly average	Annual rate
1st ½-year	181,600	9,442,000	184,000	9,611,000
June ...	185,800	9,664,000	182,200	9,474,000
July ...	177.400	9,224,000	175,000	9,990,000

COAL PRODUCTION DRIVE

An Earlier Autumn Start

THE resources which it is now necessary to devote to defence, added to the usual winter-seasonal needs and the demands created by continuing economic difficulties, have necessitated an earlier start of Britain's autumn coal production drive—by mid-September at the latest, a month earlier than last year. This was announced by Lord Hyndley, chairman of the National Coal Board, in a letter to the chairmen of the divisional boards.

"The industry of the country," said Lord Hyndley, "is running at a pressure never before experienced and the demand for coal from factories, power stations, gas works and the railways, combined with that from the domestic consumer, is rising steadily. It is now every week nearly equal to what we are producing. There is little left over to meet overseas demand and to stock up for the winter."

Individual Effort

Lord Hyndley said the coal industry's National Consultative Council, at whose instance he was writing, had unanimously decided that a production drive should again be undertaken, and he asked that divisional consultative councils should work out means of getting the intensified effort as quickly as possible in the collieries in their areas.

One of the significant passages in Lord Hyndley's message is that in which he says "The council leave it to divisional councils to decide the details, but they have asked me to remind you of the importance they attach to the more general adoption of arrangements which give an opportunity to all to produce and earn according to individual capacity. The need for more coal quickly is vital. We did well last year. This year we must do better still."

U.S. to Make 105 M. Tons of Steel

WITHIN two years, the largest expansion programme ever undertaken by the American steel industry will be completed and total capacity of the industry by the end of 1952 is expected to reach the record level of 105.75 million tons annually. In two years the industry will have increased capacity by 6.868 million tons. The United States Steel Corporation alone will increase its capacity by 1.66 million tons annually through an improvement programme at Pittsburgh and Chicago by the Carnegie-Illinois Steel Corporation.

Chemical and N-F Metal Totals

Increased Production and Usage in May

DESPITE a general increase in consumption of basic chemicals in May, stocks at the end of the month were generally higher, the level of production in most cases having improved. Stocks of ammonia and phosphate rock were nearly doubled. Exceptions were molasses and industrial alcohol, stocks of which were greatly reduced. Among the non-ferrous metals, production of virgin zinc and refined lead was higher but there was a small decline in output of aluminium, tin, and magnesium. Stocks of copper, refined lead, and zinc concentrates improved.

There was again an increase in the estimated numbers employed in the chemical and allied trades. The total for May (in thousands) was 444.6 which was slightly higher than the figure for April this year and was 12.6 more than the total for May, 1949. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 257.0 (189.2 men, 67.8 women); paints and varnishes, etc., 38.6 (27.3 men, 11.3 women); oils, greases, glues, etc., 67.0 (53.9 men, 13.1 women); pharmaceuticals, toilet preparations, etc., 82.0 (42.9 men, 39.1 women).

These figures and the table below are abstracted from the *Monthly Digest of Statistics*, No. 55 (HMSO, 2s. 6d.)

	May, 1950 Thousand Tons			May, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	156.1	159.0	--	135.2	139.0	—
Sulphur...	—	31.3	90.7	—	24.2	80.5
Pyrites	—	18.4	74.5	--	20.2	67.0
Spent oxide	—	16.3	181.9	--	16.0	169.9
Molasses (cane and beet)	10.6	36.7*	174.8	10.9	24.5*	283.5
Industrial alcohol (mil. bulk gal.) ...	3.29	3.35	0.51	1.77	1.94	4.90
Ammonia	—	5.86	11.17	—	6.94	5.91
Superphosphate	20.1	18.7		17.6	17.6	—
Compound fertiliser	180.5	179.3		122.1	94.4	—
Liming materials	—	603.4		—	537.7	—
Nitrogen content of nitrogenous fertilisers	22.34	26.59		21.25	18.66	—
Phosphate rock		87.0	314.3	—	82.5	179.8
Virgin aluminium	2.59	13.1	—	2.68	15.6	—
Virgin copper	—	31.2	124.3	—	25.8	117.5
Virgin zinc	5.42	20.1	49.8	4.99	14.3	60.7
Refined lead	6.29	14.1	65.3	2.86	11.5	47.3
Tin	2.20†	4.13	—	3.13	1.79	20.4
Zinc concentrates	—	13.5	62.6	--	11.4	31.3
Magnesium	0.32	0.32	--	0.55	0.43	—
Pig iron	186.0‡	143.0‡	490.0	187.0	143.0	260.0
Steel ingots and castings (including alloys)	319.0‡	—	1,326.0	316.0	—	1,121.0
Rubber: Reclaimed	0.57	0.59	2.41	0.43	0.48	3.46
Natural (including latex)	—	4.50	39.0	—	3.65	46.0
Synthetic	—	0.05	0.83	—	0.07	1.86

* Distilling only. † April. ‡ Average of five weeks.

American Packaging Methods

A REPORT is to be published in the Autumn on U.S.A. packaging practice, prepared by the specialist team on packaging, headed by Mr. G. M. Ashwell, packages advisor to I.C.I., Ltd. The team recently returned from America after a visit under the auspices of the Anglo-American Council on Productivity. The entire team has been invited by the Institute of Packaging to answer any questions and to discuss the report at three open meetings of the Institute of Packaging in October. Admission to the meetings is not restricted to members of the Institute. Any executive with a *bona fide* interest in packaging will be admitted.

The three meetings will be held on October 5 at 6 p.m. at the Waldorf Hotel, Aldwych, London, W.C.2; October 11 at 2.30 p.m. at the Houldsworth Hall, Deansgate, Manchester; and October 16, at 6 p.m. at the Imperial Hotel, Birmingham.

The heightened interest in packaging is reflected by the fact that all the ground floor and one-third of the first floor space at the National Hall, Olympia, London, has already been let for the second National Packaging Exhibition to be held January 30-February 9, 1951 inclusive.

THE NEXT BIF

Record Number of Applications

AN advance announcement from the BIF Press Office of the Board of Trade indicates that the 1951 British Industries Fair will be held in London, at Earls Court and Olympia, and at Castle Bromwich, from April 30 to May 11. Applications for space are said already to have indicated that this will be the largest and most comprehensive trade fair. By the end of July twice as much space had been applied for as at the corresponding period for any previous Fair.

The closing date for applications is August 19 and every effort will be made to accommodate all requests received, although sizes of individual stands may have to be limited.

The division of trade groups between Earls Court and Olympia has not yet been decided, but it is unlikely that there will be any change in the division adopted for the 1950 Fair, when chemicals were displayed at Olympia and plastics at Earls Court, although the position of the various groups within the buildings may be revised, particularly at Earls Court.

Chilean Potash Nitrate

THE Nitrate Corporation of Chile, Ltd., announces that the price of Chilean potash nitrate, containing about 15 per cent nitrogen and about 10 per cent potash, in lots of six tons or more, delivered Great Britain (c.i.f. main ports Isle of Man), will be £23 17s. 6d. per ton gross weight. The previous quotation was £19 10s. Surcharges on smaller lots will be: four tons and over, but less than six, 2s. 6d. a ton; two tons and over, but less than four, 5s. a ton; one ton and over, but less than two, 10s. a ton; two cwt. and over, but less than one ton, 20s. a ton. This quotation applies to supplies expected to arrive some time in September.

Rubber Specialists to Meet

RUBBER chemists from England, France, Italy, the Netherlands, and Germany will participate in the first international meeting to be sponsored by the Division of Rubber Chemistry of the American Chemical Society in Cleveland, Ohio, October 11-13. The overseas rubber chemists are to present half the 50 technical papers. Among the 1000 chemists expected to attend, all the U.K. rubber groups will be represented. The chairman will be A. W. Oakleaf (Phillips Petroleum Company).

FATAL BOILER EXPLOSION

Rash Use of Pressure Steam

THE jury added a rider that there was a "gross lack of supervision on the part of the contractors," when at Chester on August 9 it returned a verdict of "Misadventure" at the inquest on Mr. Harry Catton, aged 44, chargehand pipe-fitter, who died in Chester Royal Infirmary on August 3, after his leg had been blown off. The accident occurred when a boiler exploded on a site of the Shell Refining and Marketing Co., Ltd., at Thornton.

Mr. Edward Davies, a foreman pipe-fitter, employed by Foster, Wheeler, Ltd., contractors, said they were ordered to put in a tea boiler, heated by a coil, but Catton, on loan to them from the Shell Company, suggested that a steam box should be welded under the boiler. When the boiler was tested with low pressure steam, Catton said the heat was insufficient and suggested high pressure steam. He (Davies) said Catton must get permission from the Shell company and Catton later said he had done this. The coroner (Mr. David Hughes) said it appeared Catton was doing something requiring a higher form of knowledge than he possessed.

Dust and Fumes in Ironfoundries

THE Joint Iron Council, in association with the Council of Ironfoundry Associations, is to intensify work upon problems of dust and fumes in ironfoundries and to provide an advisory service on how best to deal with them in foundry practice. The work is being carried out through the British Cast Iron Research Association, a large part of whose finance is derived from the Joint Iron Council. A specially appointed Foundry Atmospheres Committee of the Research Association is supervising the work.

Chemical Employment

THE level of chemical employment in May remained almost unchanged compared with the previous month, the total (in thousands) being 444.6 as against 444.0 in April. Detailed distribution, as shown in the *Ministry of Labour Gazette*, was as follows: Coke ovens and by-product works, 17.1; chemicals and dyes, 203.2; pharmaceuticals, etc., 34.0; explosives, etc., 36.7; paint and varnish, 38.6; soaps, glycerin, etc., 48.0; mineral oil refining, 36.8; oils, greases, glues, etc., 30.7.

AUTOMATIC PROCESS CONTROL

Co-ordinated Regulating Instruments

by LEO WALTER, A.M.I.Mech.E., M.S.I.T.

THE modern trend in chemical engineering is to use what is called in the U.S.A. " Robotisation," or more commonly " Engineered control," as the application to a chemical process of several co-ordinated control instruments. All the plant operator has normally to do for fully automatic control is to push a button, and the process starts, one or several automatic control instruments taking over the duty measuring and controlling process factors.

Delicate Balance

In practice, the plant operator has, of course, continuously to supervise these " robots " in order to make sure that they work satisfactorily. This supervision of instruments must be performed, regardless of the fact that the more elaborate control systems are supposed to work without fail.

Where several controllers have to work together, they are liable sometimes to produce erratic control, caused by a tendency to hunting. This develops much more readily in engineered control than in a single control instrument. If in a plant, having various controllers working together, one instrument starts hunting for its correct position, this can bring a swinging component into the process, which caused a second regulator to start to " swing ", and so on.

This falling out of gear can happen quite suddenly, perhaps after a new process has worked satisfactorily for a short time, or even after a process has been satisfactorily controlled for some years.

The cause of failure of engineered control can be either in the process, or in its instrumentation, and investigations are not always easy. Chart records, valuable as they are in giving data on process variables and on the all-important time factor, do not always disclose the cause for unbalance of the control system.

Human interference, or changed quality of raw material, or sometimes altered energy conditions from outside (fluctuations of voltage, of steam pressure of temperature or of pressure of cooling water supply) can be the cause of the trouble. Gradual development of scale or deposits on heating surfaces up to a point when heat transfer becomes too low can be the cause, or increased friction in bearings of moving parts of the plant.

To find these causes for erratic control needs more than the skill of an instrument mechanic, who can bring a controller into working order, but may be less familiar with control theory. It requires the knowledge and skill of the works chemist and the plant engineer, and co-operation between the workpeople and the instrument expert.

Curing trouble of this nature inevitably requires from the chemical engineer a sound basic knowledge of the design and function of instruments and how their function is correlated to that of the plant. For engineered control, an additional knowledge of relation of each instrument to other co-ordinated controllers is also required.

To gain this knowledge by trial and error methods is waste of time, energy and money. The bibliography at the end of this article mentions some of the literature forming a source for study of fundamental control theory, without which no chemical plant engineer can expect to know his instruments intimately enough to be able to cure troubles, which often can be overcome by re-adjustment of control instruments.

Choice and Installation

A controlling instrument must be reliable, possess inherent stability, have good response without being over-sensitive, and be easily handled. The instrument choice depends on the required closeness of control, and on process characteristics in general. For engineered control the factor of interchangeability of parts also comes into the picture.

In thermostatic problems it is known that large or otherwise difficult process lags require instruments having an anticipating control component, which may be reset (integral), or reset plus rate (second derivative). The increasing use of potentiometric controls, based on electronic amplification results from the small instrument lags of this type, combined with the possibility to transmit control impulses over great distances, i.e., to a central control panel. This latter remote control can, however, also be achieved by the use of pneumatic transmitters, or by applying pneumatic-electric combinations.

In pressure control, the process time lags

are usually negligible, and the simpler modes of control are applicable, in instances where moderate accuracy of control suffices. For engineered control, it is, however, sometimes important to apply reset (integral) control, and to have available means for adapting responsiveness of an instrument to other controllers.

Control of rate of flow often require stabilised instrument types, as does ratio control, whereby the rate of flow in one pipeline is controlled from the rate of flow in another. The crux of the problem here is to choose the correct orifices, which is not always easy with dirty or highly viscous or corrosive fluids, and to ensure the correct pressure differential by keeping the measuring orifice clean. To keep the corrosive fluid away from the instrument requires the use of inert sealing fluids, and these must be regularly checked and replaced. Good co-operation in engineered control of a pressure controller with a rate of flow controller requires means for adjustments of both instruments, which should be preferably of the reset type.

Level Control

For engineered control, liquid level is often interconnected with rate of flow control. The ordinary ball float valve for control of filling of open-topped vessels is increasingly being replaced by either a cam-operated lever valve; or by a controller using a shaped displacer, suspended on an adjustable spring; or by a pneumatically operated level controller, producing quick filling, but much gentler valve movement near the desired level.

Combined liquid level and flow control could be effected by a level controller which readjusts the control point of a rate of flow controller working on differential pressure. The draw-off from the vessel is thus solely controlled from maintained liquid level. The valve opening will be varied to produce a rate of outflow for keeping the level in the surge tank steady, irrespective of the varying rate of inflow.

A flow control problem for hot water takes a rather different form. Boiling pans with jackets receive the heating water at full flow, but after it has been treated by a temperature mixer controlled by a thermostatic diversion valve. Another temperature regulator controls the heater temperature by regulating steam admission. Where very accurate control is required, the problem becomes much more elaborate.

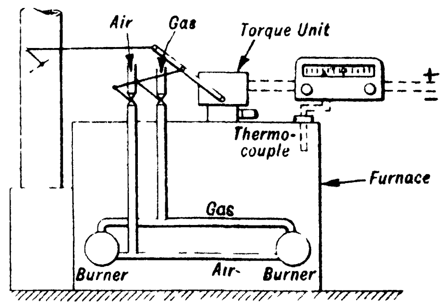

Fig. 1

Density control is used in chemical processing more than in any other branch of industry, and the mixing of two fluids is often automatically controlled.

A continual problem in combustion control for oil or gas burners of industrial furnaces and steam boilers is the continuous maintenance of the correct ratio between air and fuel, irrespective of load. Electrical control of two gas burners can be effected by automatically adjusting the rate of flow of air and of gas, depending on heat requirements. A pyrometer-controller receives impulses from a thermocouple inserted in the furnace roof, and these control impulses are transformed into control movement in a torque unit, comprising a motor which actuates the air and gas valve simultaneously. (Fig. 1.)

This air/fuel ratio control is often used in conjunction with furnace pressure and temperature control.

Combustion control has reached a very high standard for steam boilers in power stations, where it forms part of the general boiler control outfit. Unfortunately, development has not yet produced low-priced

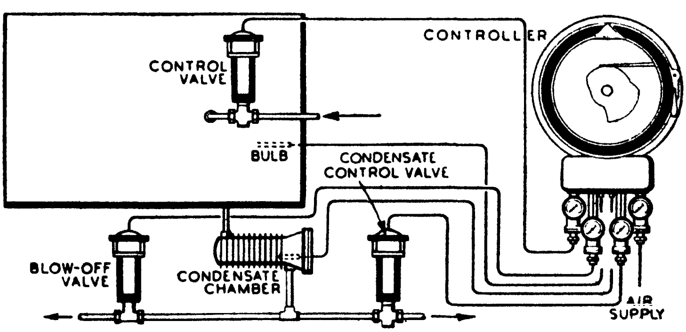

Fig. 2

standard control units for thousands of medium-sized and smaller Lancashire type and water tube steam boilers, in which fuel waste continues due to inefficient operation by hand.

Programme control automatically varies the set point of a controller according to a predetermined time schedule. The modern control of dye-vats increasingly uses programme control since low temperature dyeing has been introduced. Many chemical reaction processes could be better operated in this way, but the higher cost of programme controllers, and a certain shyness in using rather elaborate looking instruments in the small works, have delayed the wider use of programme controllers.

For Timed Processes

The use of a modern instrument with cam attachment is shown in Fig. 2 as it would be used for chemical processes where a time schedule for temperature and/or pressure is involved, or where a given rate of rise and duration of hold is indicated. A modern time cycle control instrument works on re-adjustments of the set point, the operation depending upon a cam cut to the desired temperature/time cycle.

The diagram shows a programme instrument with cam attachment, controlling steam supply to a retort, with condensate and blow-off control. More elaborate engineered control adds automatic pressure and pressure relief, and sometimes automatic admission of cooling water, etc., as in canning.

As an example for an elaborate engineered control problem, the Taylor system of fractionating column control is worthy of study. (Taylor Instrument Company, Rochester, U.S.A., and Short and Mason, Ltd., London). The purpose of a fractionating column is to separate by heating mutually soluble liquids of different boiling points. There is an overhead product, and a bottom product whose separation depends upon their boiling temperature. Primarily, the concentrations of both products have to be kept under control, and secondarily, a number of auxiliary process factors have to be controlled, such as feed rate, the draw-off rate at the bottom outlet, condenser water and static pressure within the column, etc.

Most continuous distillations use the bubble plate system. The vapours rise within the column, and bubble out under slotted caps. In order to separate two components, heat is applied, and the component with the lower boiling point evaporates, and leaves the column in a volatile form. Part of the drawn-off bottom distillate is returned in form of ' reflux " at the top of the column, in order to enrich the vapours.

When a control system is applied control of feed rate is performed by a recording rate of flow controller, deriving its impulses from differential pressure of an orifice. A proportional, or more frequently reset (integral) control is used for adjusting the control valve in the crude oil supply pipe. An average liquid level controller sees to it that the set point of the inflow controller to the column is automatically readjusted, according to level in the reflux accumulator.

The next point of control is where the overhead product is withdrawn and is operated by reflux control. Because an interchange between vapours and liquid is necessary to achieve the desired uniform vapour concentration, the quantity of reflux has to be regulated, for example, ½ to be returned, and ½ to be drawn off. Composition determines thus rate of vapour withdrawal, and of reflux feed, and the process variable most closely related to composition is temperature.

The next point of control is the cooler, where inflow of cooling water is regulated from the liquid level in the reflux accumulator. A buoyancy float type of level controller is used, which produces reduced condensation with increased liquid level, and vice versa. All gaseous substances are withdrawn from the column and from the reflux accumulator through the gas line.

Fully Regulated

A back-pressure recorder-controller in the gas line ensures that the column operates under desirable fixed gas pressure for plants operating on positive pressure (above atmospheric). A pump removes the liquid from the reflux accumulator, and a reflux flow controller regulates feeding back to the column.

The flow of liquid from the bottom of the column is to a heat exchanger vessel, a reboiler, which is heated by steam-controlled coils. A liquid level controller of the ball float type, having a narrow proportional band is applied, acting on a control valve in the draw-off pipe of the bottom product.

A temperature regulator operates a control valve for steam admission to the reboiler, and reset control with valve positioner is usually applied in view of process characteristics. The thermostat bulb is located in the reboiler vapour line back to the column. Application of controlled heat in the reboiler ensures suitable composition of the bottom product.

It is not desirable to go further into the intricacies of fractionating control, which needs much specialised experience, but the

example helps to emphasise the widespread uses of instruments for engineered control.

The writer, before the war, equipped one of the most up-to-date small oil refineries in Central Europe with an entire control outfit, using British, American and German automatic controllers. The layout and modes of control were worked out in close co-operation between chemists, plant engineers and control experts with very satisfactory results (a note in a newspaper mentioned recently that the plant is in full operation today).

The above example is only one layout possibility for petroleum and distillate stabilising columns for petroleum fractionating. It is perhaps unnecessary to stress the urgent need for ample adjustability of each control instrument, in order to achieve perfect "engineered" control.

It cannot be emphasised too much that the correct choice of control method and of type of control instrument is most essential, even for straightforward control problems. This applies even more forcibly to problems where the function of one control instrument influences other controllers dealing with process variables in the same plant equipment.

To make application of engineered control easier, the designs of modern chemical plants should be worked out with due consideration of good controllability in the drawing-board stage, and experience on pilot plants should be fully explored in order to improve controllability of the final full-scale plant.

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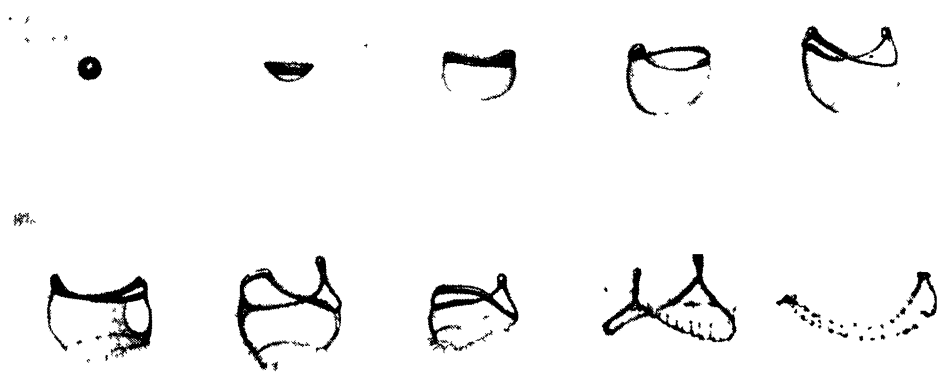
Canada's Raw Materials

THE fortunate position of Canada in possessing raw materials for chemical industry, second only in amount to that of the U.S.A., was mentioned by A. H. Smith, president of Monsanto (Canada), Ltd., in an address to the Chemical Institute of Canada, in Toronto recently. Although not always advantageously located, there are plentiful supplies of coal, oil, natural gas, water power, timber and various minerals, items lacked by many other countries. Canada's domestic market provides a sufficient outlet for many items.

The Disintegration of a Water Droplet



THE Ministry of Supply was responsible for the production of this remarkable series of pictures which help to make substantially clearer irregularities in the dispersion of water, and indirectly of water suspensions, in a high speed air stream.

Water drops of 2.6 mm. diameter were allowed to fall into a small transparent vertical wind tunnel, down which a stream of air was steadily maintained. They were photographed at various stages of their break up by means of a flash discharge tube operated photo-electrically by the falling drop. At a critical velocity of the air stream, 22.5 metres per second, the drop became flattened, then was blown out into a bag form, attached to a roughly circular rim. The bag then burst, producing a shower of very fine droplets. The later disintegration of the ring produced much larger droplets.

These photographs formed part of the recent exhibition of high-speed photography organised by Ilford, Ltd.

Industrial Value of Bismuth

Expanding Range of Metallurgical Applications

INCREASING attention has been given in recent years to the potential industrial applications of bismuth, particularly its metallurgical uses.

Bismuth minerals are usually found in pegmatites, granites and gneisses, generally in subordinate amounts associated with other economic minerals, from which they are extracted as by-products. All occurences of bismuth ores are of magmatic origin and are usually found in association with copper, tin, silver and gold ores.

Limited Exploitation

A comprehensive survey of the sources, production, properties and applications of bismuth has been provided by *The South African Mining and Engineering Journal* (Volume 61, part 1) which pointed out that this metal has so far only been mined in the Union to a very limited extent. It is, however, of fairly widespread distribution and occurrences in Namaqualand are regarded as most promising, primarily because of the possibility that bismuth could be obtained in that area as a by-product during the production of other useful minerals.

The world's largest producers are Mexico and Peru. There are no important deposits in the U.S.A., but bismuth is recovered as a by-product from imported lead and copper ores and from Mexican bismuth-lead bullion bars.

Canada is an important producer of bismuth, the Canadian production being derived mainly from the treatment of silver-lead ores at Trail, British Columbia, and of silver-cobalt ores at Delores, Ontario.

The extent of production in the U.S.S.R. is unknown, but in 1940 operations were started by a new bismuth plant at Adrasinan in Tadzhikistan.

There is a limited output in Australia as a by-product from the bismuth-tungsten and tungsten-molybdenum mines in Queensland.

Europe is the largest consumer of bismuth. World consumption has enormously increased in recent years, and is believed to have approximately quadrupled between 1940 and 1942. The leading bismuth compounds are bismuth subnitrate, subgallate and subcarbonate. The various bismuth compounds, salts and mixtures are used for a number of medicinal preparations.

Bismuth salts are used with oxides of other metals to impart colours to porcelain and with gold for gilding it. Bismuth nitrate gives to porcelain a colourless irridescent glaze. The salt is also used in printing fabrics and in making optical glasses. Another use for bismuth compounds is for controlling blue mould on tobacco.

Alloys of bismuth are important because of their low melting point and because their volume either expands or is unchanged upon solidification from melts. Alloys with lead, tin and cadmium have melting points which are much below those of the constituent metals. Several of these low-fusion alloys melt below the boiling point of water, and some can even be softened by the heat of the hand.

Low-melting alloys of bismuth (43-55 per cent) with lead, tin and cadmium are used in spotting fixtures, die setting, anchoring machine-tool bushings and tube bending. Similar alloys, some with melting points as low as 117° F., are used in sprinkler apparatus and fire-detector systems. Additions of 0.1 to 1.5 per cent bismuth to stainless steel, copper and aluminium alloys improve machinability.

Their property of expanding upon cooling renders some alloys of bismuth suitable for making castings of detailed objects.

Before the war, the greater part of the world's bismuth output was used in medical and cosmetic preparations. So rapid has been the development of other uses, however, that in 1942 metallurgical applications of bismuth were quantitatively more important than the pharmaceutical uses.

Uses of Bismuth in U.S.

Bismuth shipped during that year by producers and importers in the United States is estimated to have comprised only 45 per cent for use in pharmaceuticals and other compounds, as against 31 per cent in solders and bearings, 15 per cent in spotting fixtures, die setting, anchoring machine-tool bushings and tube bending, and 9 per cent in miscellaneous applications.

Despite the very substantial increase in output which has taken place, the expansion of metallurgical uses should assure producers of a fairly stable market for a metal which, on account of its relative scarcity, seems unlikely to be affected by serious problems of price fluctuations and over-supply.

A NON-MAGNETIC MASS SPECTROMETER

Industrial Possibilities Using an R-F Field

A THREE-STAGE non-magnetic spectrometer, employing the principle of velocity selection, has recently been developed by Dr. Willard H. Bennett of the U.S. National Bureau of Standards. In the new spectrometer a radio-frequency field replaces the usual magnetic field. Combining unusually simple operation with small size, light weight, and high sensitivity, the instrument holds promise for applications in several fields of science and industry.

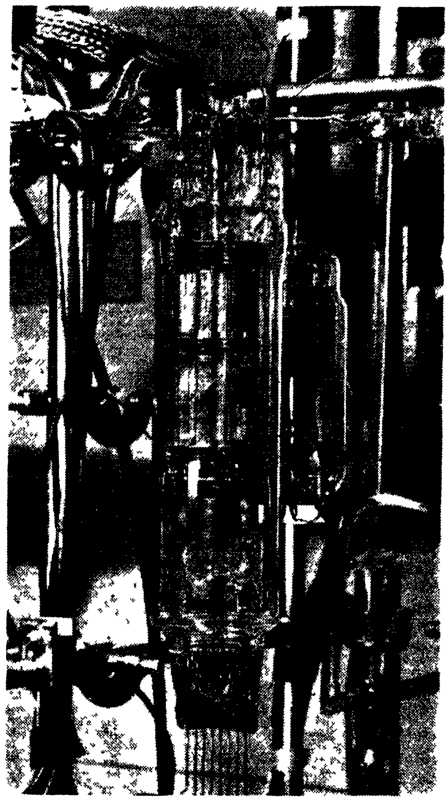
In ordinary mass spectrometers a high intensity beam of ions is bent in the field of a large iron magnet, passed through a narrow slit, and then focussed accurately on a narrow receiving slit.

The non-magnetic mass spectrometer uses neither bending or focussing. Ions produced in the ionisation chamber travel in parallel paths through the tube, which is a glass cylinder 8 in. long and 2 in. in diameter. Three sets of three tungsten wire grids are spaced along the tube to form the three stages. A radio-frequency potential is applied to the middle grid in each stage. An additional grid, with a negative potential applied, follows the final stage and, in the absence of r-f potential, turns back any electrons that may have arisen anywhere along the tube. Following the final grid is a collector plate whose potential is sufficiently positive to repel all but the desired positive ions.

Maximum Energy per Stage

The distances between grids, and between stages, are selected very accurately so that for any particular ion mass there will be a single definite frequency of the r-f potential which can speed up ions of that mass as they pass through each stage. The increased speed of these ions enables them to overcome the opposing potential on the collector while all other positive ions are turned back. Successive distances between stages must be chosen so that the r-f potential will complete an exactly integral number of cycles during the time it takes for an ion of the desired mass to travel between stages, picking up maximum energy in each stage.

The best combination of these integral numbers for a three-stage tube is found to be 7 and 5, and in actual operation the seven-and-five cycle tube has completely separated the isotopes of chlorine. From this observation it is estimated that a four-stage tube, using integral numbers 18, 11, and 7, should resolve masses differing by only 1 per cent.



The new three-stage assembly

The spectrometer can utilise all the ions that can be made to emerge through a grid several centimeters in diameter, and a new kind of positive ion source has been developed to take advantage of this. A spiral filament delivers an ionising electron current of 100 milliamperes through a double grid attached at one end of a hollow metal cylinder 3 centimetres deep. The far end is closed by a grid and near it is another grid at a negative potential which turns back all electrons and draws positive ions out from the cylindrical enclosure. At a pressure of 4×10^{-5} mm. of mercury the source delivers a positive ion current of 100 microamperes.

By an appropriate change in ion source

and reversal of potentials, the spectrometer lends itself to the study of negative ions, an important feature of the new instrument. Since negative ions are, in general, much less abundant, when they exist at all, the unusual sensitivity of the Bennett spectrometer is a great advantage in the study of negative ions.

In the development of vacuum tubes, as, for example, power transmitting tubes, a spectrometer of this type can be of great assistance in analysing gases and vapours evolved from the heated electrodes.

Surface reactions are another group of processes for which the new spectrometer can be used, separately analysing the positively or negatively charged components. In gaseous discharges, the instruments can be used for direct analysis of the ions without magnetically disturbing the discharge.

One of the urgent needs of the U.S. Bureau of Mines is an instrument which can be used in the field for the analysis of small percentages of hydrogen in the manufacture of helium. The new spectrometer has adequate sensitivity and resolution for this task, and can be readily adapted to automatic operation.

Similarly, the new instrument could be used for continuous observation of the air in an enclosed space, giving warning of the presence of dangerous components such as hydrogen or chlorine. In addition, an active project is now under way at the U.S. National Bureau of Standards to adapt this instrument for use as an extremely sensitive carbon monoxide detector. The low weight and compactness of the non-magnetic spectrometer also offers a way to settle the question of the chemical composition of the upper atmosphere.

The non-magnetic mass spectrometer is now being adapted to the rapid scanning of mass spectra. Present methods permit sweeping twice a second through the mass range from 10 to 50, displaying the measured mass components directly on the screen of a cathode-ray oscilloscope. The scanning is accomplished by sweeping the ion accelerating voltage from 50 to 250 volts, while modulating the r-f potential with a 1000-cycle signal.

New Uses for Tri-butoxyethyl Phosphate

FOR a number of years, tri-butoxyethyl phosphate, sometimes known as tri-butyl "cellosolve" phosphate, has been used as a plasticiser for synthetic rubbers, producing cured stocks with many excellent properties, including flexibility at extremely low temperatures.

More recently, tri-butoxyethyl phosphate has been successfully employed as a plasticiser for vinyl plastics. It is particularly valuable as an additive for vinyl polymers used in film production, because it accelerates milling and fluxing and facilitates extruding and calendering. Its other advantages include low temperature flexibility, permanent flexibility, low surface tension, resilience, good drape and handle, non-inflammability, and stability when subjected to ultra-violet radiation. The main disadvantage consists of a tendency towards migration of the plasticiser, unless this is retarded by careful compounding and use of special non-migrating plasticisers.

The principal industrial uses of tri-butoxyethyl phosphate can be summarised as follows:—

1. Because of its low surface tension at low viscosity it is particularly suitable for making plastisol pastes, such as PVC.

2. Tri-butoxyethyl phosphate possesses strong solvent powers for alkyd resins, gums, varnishes, lacquers, etc., and it is recommended for use as a paint remover and brush softener.

3. In concentrations of 1-2 per cent it is useful as a defoaming agent.

4. Rusted metal parts can be quickly cleaned in tri-butoxyethyl phosphate, which has no corrosive effect on the metal itself. It has been suggested as a possible additive in penetrating oils.

5. The low viscosity of this compound (12.2 centipoises at 20°C.) and extremely low power point (−70°C.) make it of interest as an additive in low temperature lubricants.

Tri-butoxyethyl phosphate is a colourless liquid with a mild ester-like smell. It has a freezing point of −70°C. (viscous liquid) and flash point 435°C. (224°C.). The mid-boiling point at 4 mm. is 222°C. and vapour pressure at 150°C. 0.10 mm. mercury. The solubility of tri-butoxyethyl phosphate in water is 0.11 per cent and 25°C. and the solubility of water in tri-butoxyethyl phosphate is approximately 7.8 per cent at 25°C. Tri-butoxyethyl phosphate is completely soluble in petrol, soluble to the extent of 50 per cent in mineral oil, freely soluble in most other organic liquids except glycerin, glycols and certain amines.

Practically all resins are soluble in tri-butoxyethyl phosphate, the least soluble being acrylic resin and the gum, damer.

WASTE TAR AS A CHEMICAL SOURCE

The Development of Valuable Derivatives

by H. T. PINNOCK, M.A., F.R.I.C., F.C.S., M.Inst.F.*

IN the manufacture of producer gas by the Mond ammonia recovery process, the tar produced differs greatly from that made during the manufacture of town gas, whether made in vertical or horizontal retorts.

At the works of the South Staffordshire Mond undertaking at Tipton, this tar in the early days of the company caused a lot of trouble. The tar distillers did not want it, as it was not only difficult to distil, but the oils produced from it were so different from the ordinary run of tar oils that they were difficult to dispose of. Mond tar oils contain no benzol, naphthas or naphthalene.

The board of the former gas company, largely at the instigation of Sir Alfred Mond (later the first Lord Melchett), decided that the tar must be thoroughly investigated to see whether it contained anything of special value for industrial purposes.

The work subsequently carried out laid the foundations on which were built up the range of germicidal products and anti-corrosive agents and preservatives, handled by two subsidiary companies, Monsol, Ltd., and Melanoid, Ltd., which are now controlled by the West Midlands Gas Board.

Effect of Increased Molecular Weight

As regards the disinfectants, which are handled by Monsol, Ltd., it was very soon found that the tar oils contained large quantities (about 35 per cent) of the higher homologues of phenol and other poly-hydroxy compounds of high molecular weight.

It was well-known that, everything else being equal, in respect of the phenols, the higher the molecular weight the greater the germicidal efficiency and the lower the toxicity of the product. It was likely, therefore, that a very efficient germicide could be produced from Mond tar oils, although it was not realised until later how efficient this germicide would prove.

Eight years' research work in isolating the best fractions, devising the best means of emulsifying the very insoluble products, conducting a long series of bacteriological investigations and clinical trials at various large hospitals, resulted eventually in the Monsol range of antiseptic and germicidal preparations, which are now well-known and appreciated by the medical profession and the public.

The Monsol products combined in one germicidal base five properties which had not hitherto been brought together in one preparation. These were:—

1. A high germicidal efficiency almost unimpaired in the presence of organic matter. This was a most important point as many preparations, e.g., iodine, the hypochlorites and permanganates, lose almost the whole of their efficiency in the presence of blood, pus and serum.
2. Remarkable freedom from irritant effects common to antiseptics of the phenol type.
3. A high degree of penetrative power, enabling the disinfectant to deal with deeper infections than had hiherto been possible.
4. A selective action against certain organisms, notably the gram-positive organisms which are responsible for the bulk of the septic conditions normally encountered.
5. Low toxicity to human beings and the higher vertebrates.

The result was an antiseptic of great potency, which even in concentrations higher than necessary for effective action is harmless to tissues and does not impair their normal recuperative power.

The Monsol germicide and antiseptic was made up into a variety of preparations, all possessing the five properties above-mentioned. All these received extensive medical and clinical and hospital trials before they were approved.

In the past fifteen years there has been a tendency in antiseptic practice as regards liquid antiseptics to get away from the dark coloured disinfectants with a phenolic odour to a lighter coloured fluid with more pleasant odour.

In this field Monsol, Ltd., were also one of the pioneers. As early as 1928 this end was in view, but it was not until 1932 that the problem was completely solved. The company then introduced Neo-Monsol, a liquid germicide which possesses all the five properties mentioned and has in addition a much pleasanter smell and lighter colour. The active principle in Neo-Monsol con-

* An abstract of an article of which the full presentation appeared in THE GAS WORLD, (132, 3443)

sists of chlorinated tar acids or phenols derived from tar.

The other subsidiary company, Melanoid, Ltd., deals with preservative and anti-corrosive products, the most interesting of which are Tectal net and rope preservative and Tectal wood preservative, which are made from another fraction of the Mond tar oils.

The net and rope preservative is of particular interest because it provides a preservative which is acknowledged to be outstandingly efficacious, and being produced entirely from home materials it does away with the necessity for importing foreign wood tars, which have for 200 years been largely the basis of rope and net treatment.

No "Tendering" with Tectal

Where Tectal scores particularly is that its use never decreases the tensile strength of ropes, and sometimes actually increases it. Most preservatives cause a certain amount of "tendering" whereby some 10-20 per cent of the initial strength of the rope is lost after the anti-rot treatment, before any exposure to the elements has taken place.

The reason for the superiority of Tectal in producing no initial "tendering" is due to the difference of the phenolic bodies it contains as compared to those in wood tar and coal tar creosotes.

In general, rope preservatives, whether derived from wood tars, e.g., Archangel & Stockholm tar; coal tars, e.g., creosotes; Mond producer gas tar, e.g., Tectal; all depend for their preservative action on the presence of phenolic substances, the "tar acids." By the toxic action of these acids on the micro-organisms, fungoid growths and insects that cause rotting, the life of cordages is enormously increased.

Everything else being equal, therefore, it is desirable from the point of view of inhibiting microbial and similar attacks that the proportion of tar acids should be as high as possible.

There is, however, a snag here. Tar acids, either in wood tars or in ordinary coal tar creosotes, produce a definite chemical attack on the vegetable fibres of which cordage is composed, and cause the initial "tendering" to which reference has already been made. Consequently, it becomes necessary to strike a balance between the amount of initial "tendering" and the final preservative action.

It is useless to increase the percentage of tar acids to get longer life, due to freedom from microbial attack, so that the rope has lost 25 per cent or more of its original strength owing to chemical attack, before any exposure has taken place.

This fact is recognised in the official specifications for "Creosote for the Preservation of Ropes and Cordage", in which it is stated that the maximum percentage of tar acids permissible is 10 per cent.

With Tectal, on the other hand, the situation is quite different. The tar acids have no such chemical attack on the cordage fibres and cause no initial "tendering". This has been proved repeatedly, so that while the official specification for coal tar creosote calls for a maximum of 10 per cent tar acids, the official specification for Tectal calls for a minimum of 30 per cent tar acids.

The same basis is used in the manufacture of Tectal Wood Preservative. Owing to its low viscosity it has great powers of penetration into the timber, and it can also be pigmented and supplied in various colours. Timber treated with it is immune to attack from white ants, which makes it of particular value in the tropics.

The genesis of another development was the fact that at the Mond gas works at Tipton many years ago, extensive corrosion of iron and steel work occurred owing to sulphuretted hydrogen, ammonia and sulphuric acid attack. At that time, no paints tried—and very many were tried—were successful in combating this adequately, and in consequence an investigation was undertaken with a view to providing something better.

Bitumen paints or modified bitumen-oil paints were found to fill the need, and after being thoroughly proved on the works, were put on the market in a variety of grades. In one or two of these a special pitch is used, but in general it was found that blends of natural and residual bitumens and asphalts were superior, and these are now used as the basis.

Many grades are made for special purposes, and acid-resisting paints for the interior of chemical and bleaching works are a speciality.

For gas works there are grades suitable for practically all purposes, except holders, for which it is hoped to bring out a special grade next year.

Lancashire Paint Firm in South Africa

The Leyland Paint & Varnish Co., Ltd., Leyland, Lancs., expects to start production towards the end of this year at its new £150,000 20-acre factory at Mossel Bay, South Africa. Some machinery has already been installed and more is on the way. Houses have been built in the vicinity for key workers from Lancashire. The firm hopes eventually to operate also in Southern Rhodesia.

Terpene Phenolic Resins

Their Use in Wax Polish Manufacture

From A CORRESPONDENT

INDICATIVE of the versatility of terpene phenolic resins is their acceptance by polish manufacturers as major ingredients of self-polishing floor waxes, particularly the liquid bright-drying, emulsion-type polishes used for furniture and floors. These resins have the advantage of being readily compatible with carnauba and micro-crystalline waxes, and they increase the hardness and also slip-resistance of deposited wax films.

Reducing Costs

Apart from endowing wax formulations with improved polishing performance, the terpene phenolic resins, as major additives, are very economical in use and, in the proportions generally advocated—25 per cent to 50 per cent of the total wax and resin proportion of the emulsion—they tend to lower manufacturing costs. Both high and low melting point resins are today being recommended, the high melting type being about 135° C. and the low melting point grade in the region of 100° C.

The advantages justifiably claimed for terpene phenolic resins can be summarised as follows:—

1. They are readily emulsifiable and compatible with both vegetable and mineral waxes.

2. They are available in a reasonably wide range so that where special properties are required there is a specific resin available for the purpose, e.g., where formulations contain oxidised micro-crystalline waxes the addition of a harder, higher melting point terpene phenolic resin is able to produce harder wax films with less tack. By careful choice of resin the manufacturer is able to exercise greater control over his polishes and to endow them with special properties.

3. They are suitable for incorporating in wax formulations to be processed or mixed in steam-jacketed equipment. The average wax kettle usually caters for wax mixes having a melting point of 100°-115° C; terpene phenolic resins are available with a melting point for 100°-185° C.

4. They do not affect the colours (wax-soluble dyes) normally employed in polishes and have no objectionable smell.

5. They are economical in use.

6. They exercise no corrosive effect on tins or other containers.

7. They are unaffected by new emulsifying agents, such as 2-amino-2-methyl-1-propanol, which has a melting point 30°-31° C. and boiling point of 165° C. at 760 mm. The higher fatty acid soaps of this emulsifying agent possess extremely high emulsifying efficiency and are stable in colour.

8. The terpene phenolic resins can be obtained with a pH in the region of 8 and are therefore not liable to affect the efficiency of most emulsifying agents, which appear to have a pH of 9-11 at 20/20° C.

9. The resins are light in colour and, moreover, they are stable and not liable to darken through oxidation.

Adoption in the U.S.A.

Wax polish manufacturers are now finding that these terpene phenolic resins are valuable for three major reasons; their inclusion in non-rub or self-polishing waxes tends to lower costs, yet at the same time they impart improved properties to the polish and therefore give better value to consumers. It is, however, important to point out that self-polishing waxes have not yet achieved the same popularity in the United Kingdom as in America, where considerable and valuable experience has been gained in the manufacture and use of this type of polish. Moreover, special terpene phenolic resins of the kind described have been developed specially for the purpose.

Compulsory Use of Alcohol Fuel in France

THE abundance of alcohol stocks in France, which will probably be doubled by the end of the year because of the unusually promising wine and sugar beet crop, is reflected in a French Government decision that 10 per cent of petrol importers' purchases must consist of pure alcohol. This will oblige them to mix petrol and alcohol as this is the only practicable way to dispose of the 10 per cent. It is believed that the mixture will be two francs cheaper than the price of ordinary petrol. A paradoxical situation may result, as the cost of petrol is about Fr.12 per litre, less tax, and the Government pays alcohol producers Fr.80 per litre.

The Chemist's Bookshelf

CHEMICAL ENGINEERS' HANDBOOK. Revised 3rd edition. Edited by J. H. Perry. 1950. New York, London and Toronto. McGraw-Hill Book Co., Inc. Pp. xv + 1942. 144s. 6d.

This is the third edition of the work first published in 1934. It differs from the previous editions not only in that it has been brought up to date, but it now has a larger page size than hitherto. This has resulted in a more conveniently handled volume, as well as allowing for larger scale graphs and diagrams, which alone would give this edition an enhanced value.

However, in the arrangement and content matter even more practical advances have been made. The book is now divided into thirty sections which are numbered and thumb-indexed. Eighteen of the original sections have been revised and a further nine have been rewritten and expanded. The authors have also taken the bold step of deleting some of the previous sections or chapters " in order to use the space for material believed to be more valuable in this handbook."

From the point of view of the chemist the most interesting addition to " Perry " will be the matter on azeotropic, multicomponent, extractive and molecular distillation. There is also a small sub-section on dialysis, which is new. The chemical engineer in turn will welcome the sections on furnaces and kilns and on size reduction and enlargement.

From the engineering standpoint it will at once be seen that the considerable changes made in this edition render it even more useful as a reference volume. Although the price of the book is high, no chemical engineer should be without access to a copy and it should be available in every works reference library.—P.M.

LA SECURITE DANS LES LABORATOIRES ET LES FABRIQUES DE PRODUITS CHIMIQUES MINERAUX. Francis Barillet. 1950. Paris, 8 Rue de Miroirnesil.

A wealth of basic information about the toxic potentialities and characteristic effects of a wide range of chemical materials is comprised in this substantial addition, the fifth, produced on behalf of l'Industrie Chimique and le Phosphate Reunis. The treatment of most of the substances follows the same plan and is chiefly concerned with their effects upon man and incorporates a good deal of semi-clinical observation. Included now is a chapter (of 21 pp) reviewing the radio-active materials and radiations of various kinds. This does not, of course, throw new light on this new potential source of danger to laboratory and other workers, but it usefully defines its extent and likely avenues of attack. Sections deal with preventive measures, control and medical surveillance of those who may be exposed to harmful radiations. The 21 chapters are concerned with these metals and their compounds: lead, thallium, mercury, tin, gold, manganese, iron, nickel, cobalt, chromium, platinum, iridium, osmium, ruthenium, palladium, uranium. In a further part (8) are similar studies of the benzene group, petroleum products and CCl_4.

A CONCISE PHARMACOLOGY AND THERAPEUTICS. F. G. Hobart and G. Melton, 1949. London: Leonard Hill, Ltd. Pp. xxviii + 234. 21s.

This concise summary of applied pharmacology up to the end of 1948 is the third edition of the work which first appeared in 1937. Topics dealt with in this edition afford fresh information on vitamins, sex hormones and the antibiotics substances, in addition to the useful material previously presented. The introduction observes that proprietary names tend to be confusing; the author might have clarified matters by more systematic indexing and by placing the proprietary index next to the general index at the end. There also appears to be a lack of correlation between the nomenclature used and that given in the BP 1948 and the BPC 1949. For example, Phenoxetol appears on pages xxv and 165 with that spelling, but on page 232 it is given as Phenoxytol, and in the index of proprietary drugs the manufacturers are indicated by the designation Ni, which does not appear in the key to manufacturers on page ix. The new name of this compound is, in fact, Phenoxyœthanol.

The book is, however, one which, despite a few minor blemishes, can be recommended to both students and practitioners of pharmacology.—H.D.T.

WIDENING USE OF WELDING PROCESSES

*Construction and Repair of Chemical Equipment**

THE greatly increased need for gas and liquid storage vessels on a large scale, to which the new petroleum refining programme has given a fresh impetus, suggests that there will be a proportionate increase in welding constructional techniques. The great majority of pressure vessels for oil and chemical industries are welded and welding is being applied even more freely in setting up the elaborate pipe installations which form an important part of the new refinery units.

It was recently reported that 200 welders were operating at Fawley alone and the number was likely to be increased to 300 for the work of installing the 300 miles of pipeline and similar operations on the large catalytic cracking installation, pipe stills and storage tanks.

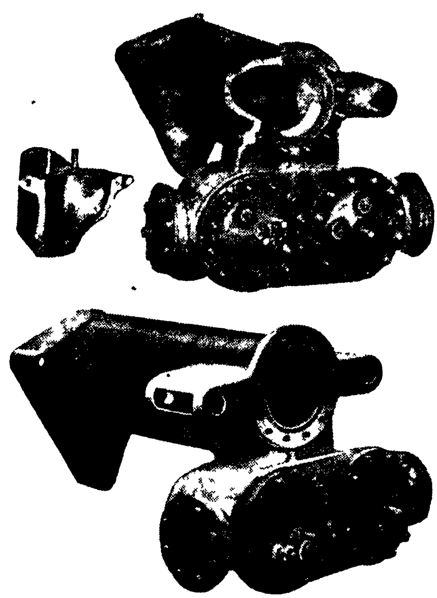
The suitability of welding for storage tank construction has been established in the U.S.A. where the spherical all-welded pressure tank is a familiar feature of the scenery in the petroleum areas. There are in this country at least two examples and it is thought there will be many more.

The resistance of this form of tank was established in a recent test of a 100,000-gall. vessel of special design. It showed no sign of failure under intermittent pressures ranging up to 1200 p.s.i. and when tested to destruction no fracture occurred until 3300 p.s.i. had been applied.

Repair of Chemical Plant

The application of welding construction to pressure and similar vessels by its comparative novelty tends to overshadow the service, at least as profitable, that welding continues to give in maintenance and repair work, particularly perhaps in respect of chemical plant. Replacement problems are generally more complicated in chemical industries than in most others because of the individual character of much of the equipment. Chemical engineering does not readily lend itself to standardisation and the simple duplication of components. Welding can, in this connection, enable substantial reduction of costs to be made. Patterns and castings can often be dispensed with, and even forgings may be replaced by flame cutting from steel billets.

Expense is, of course, not the only consideration operating in favour of welding.



By courtesy of Barimar Ltd

Two photographs which illustrate a highly successful piece of first-aid applied to a component vital to many chemical industries, a pump of which the fractured casing was quickly reconstituted with no loss of strength

The time factor is often even more important in chemical processes, and the speed with which most welding jobs can be carried out is a valuable recommendation.

A concrete example of rapid rehabilitation of a somewhat complicated item was work done recently on a lorry having a cast iron pressure tank of somewhat elaborate design. The pressure vessel, weighing 3½ tons, had developed several fractures in the base, one of which extended for several feet. All these fractures were made good in very much shorter time than any other means of replacement would have required. It then withstood a high pressure test far in excess of anything required under ordinary working conditions.

Apart from the repair of broken parts and the reconditioning of items that are worn and corroded, a good deal of work

(continued at foot of next page)

* This article is based on information supplied by Mr. C. W. Brett, managing director of Barimar, Ltd.

METAL RECOVERY

A PROCESS known in the smelting industry as "slag fuming" is now being used in the United States and Canada to recover large quantities of zinc, lead and other critical metals.

During and since the last war, three installations of slag fuming equipment for recovering metals from slag dump residue have been made in the U.S.A., according to the Babcock & Wilcox Company, which has worked closely with the smelting industry in developing the equipment. The first installation of fuming equipment was in the Kellog, Idaho, plant of the Bunker Hill and Sullivan Mining Company. This operation recovers 40 to 45 tons of zinc, in addition to a smaller amount of lead from approximately 400 tons of slag daily. Now being erected at Flin Flon, Manitoba, in the Canadian Northwest, is an equipment with which the Hudson Bay Mining and Smelting Company will treat an 800,000-ton residue containing about 26 per cent of zinc.

In slag fuming, zinc or lead, as vapour or fumes, is extracted from the surface of molten slag and is converted into a metallic oxide for further processing into finished metal.

Technical and Scientific Register

THE number enrolled on the Technical and Scientific Register at June 12 was 5366 according to the July report of the Ministry of Labour. This figure included 3443 registrants already in work who desired a change of employment; 709 students provisionally enrolled and 1214 registrants (including 524 ex-Service men and women) who were unemployed.

Vacancies filled during the four-week period May 16 to June 12 totalled 217, including 71 ex-Service men.

WIDENING USE OF WELDING PROCESSES

(continued from previous page)

is being done in modifying existing plant. Sometimes this is to eliminate obsolete parts although such work is often designed to meet the needs of new processes. Such alterations are often done speedily by the application of scientific welding and there are many instances in which it would be hard to specify any practicable alternative, apart from the procuring of entirely new equipment. It is in circumstances of this kind that scientific welding is making its most conspicuously useful contribution to chemical equipments.

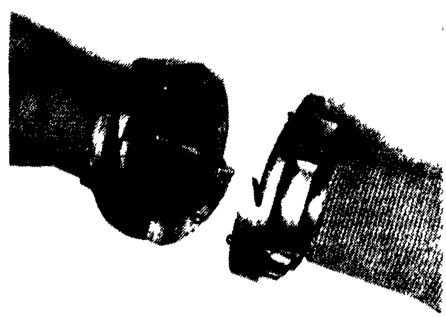
NEW HOSE COUPLING

AN improved coupling for hoses which can be opened under pressure has recently been designed by Mr. A. Bailey of the new Joint Fire Research Organisation, Boreham Wood. Tests have shown that it avoids the failings of existing types and it should be an important advance, in particular in the design of fire-fighting equipment.

Simplicity

The characteristic of the new coupling is its simple construction and it will stand rough treatment. It consists of only two main metal parts for each half coupling which can be made by die casting and require the minimum of machining. The two halves are identical, so that any two lengths of hose can be coupled together at either end. The joint is made instantaneously by placing the two halves together, face to face, and giving a slight clockwise twist. The coupling is positively locked by two small spring bolts projecting from the faces and to disconnect it is only necessary to press in two buttons which release the bolts and permit the two halves to fall apart.

The coupling can be applied to either pressure or suction lines. An important and unique feature is that it can be disconnected easily even under an internal pressure of 40 p.s.i. This is a great advantage when it is necessary to extend a line of hose as quickly as possible. The coupling, which is the subject of a patent, should have many other purposes in industry.



The two halves of the coupling, showing the simple locking device

Technical Publications

INVESTIGATIONS carried out in its laboratories on the influence of precipitations at the grain boundaries on the resistance of chromium-nickel steels to general corrosion are described in the "Sulzer Technical Review" (No. 1, 1950). Corrosion phenomena was found to be due to a very small deviation from the normal in the composition of single crystals.

* * *

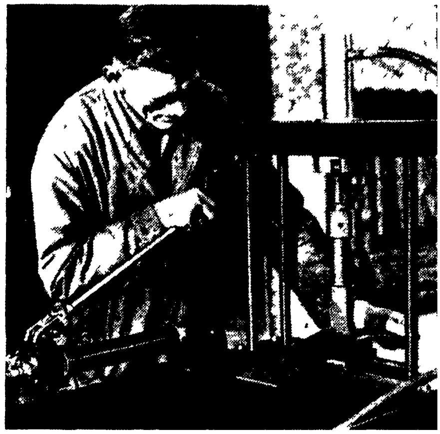
THE fact that liquid metals may be used as coolants in nuclear chain reactors adds to the topical interest of the information contained in "Liquid Metals Handbook", now available from the U.S. Government Printing Office, Washington, D.C. ($1.25). Among the subjects discussed in this 194-page book—by the U.S. Atomic Energy Commission, the Office of Naval Research and the U.S. Navy's Bureau of Ships—are: physical properties of some liquid metals, chemical properties and laboratory techniques, resistance of materials to attack by liquid metals, heat transfer, and industrial utilisation.

* * *

A NEW list of the wide selection of the compounds of nickel, cobalt and selenium, and also tellurium and copper salts regularly supplied by the Mond Nickel Co., Ltd., London, is now available in booklet form. The chemicals are conveniently arranged and tabulated according to formula, metallic content, colour and form, trade or industry, and purpose for which they are used.

* * *

"HOW you Can Work Safely" is a new simplified safety manual just published in the U.S.A. by the Gray Iron Founders' Society, largest association in the American foundry industry. The booklet is attractively printed in two colours and well illustrated. It is intended for distribution to employees in any grey iron foundry, regardless of the working conditions existing in the shop. The booklet was prepared under the supervision of a committee of foundry safety experts. It covers all general and departmental safety hazards known to exist in the U.S. iron foundries, and provides a means of ensuring that each employee has the means of learning specific safety hazards applicable to his particular job. The book inaugurates a broad safety programme sponsored by the society from its headquarters at 210 National City, E 6th Building, Cleveland 14, Ohio.



[By courtesy of Chamberlain Industries, Ltd

A new tool suited to a wide variety of applications in a number of industries is the Hydroram. Portability is one of its main features and one man, with the unit and its accessories, can pull, press, lift, bend, clamp and generally perform all the functions of human hands, with 200 times the thrust

A NEW shaker for screening oil-base mud or other high viscosity and heavy muds is the shale shaker (No. 49) announced by the Link-Belt Co., Chicago, and described in its booklet No. 2336. All parts of the shaker are zinc treated. This baked-on corrrosion resisting coating penetrates the surface. It is claimed, that in two years of off-shore drilling under exposure to salty atmosphere and in the laboratory under corrosive action, this protective treatment was superior to galvanising or comparable treatment.

* * *

AN ENTERPRISING endeavour to attract the foreign buyer is the illustrated catalogue (No. 1002) published in French and now available from George Kent, Ltd., showing its range of industrial instruments. A similar edition is also obtainable in Italian, while further productions in Danish, Swedish and German are now being printed.

* * *

PROGRESS in the search for cheap and effective methods of removing sulphur impurities from synthesis gas is described in a new U.S. Bureau of Mines publication (Report Investigation 4699).

OVERSEAS CHEMISTRY AND INDUSTRY

FIVE-YEAR PLAN IN EASTERN GERMANY

Penicillin Production at Höchst

A FIVE year plan, to succeed the present two year plan, after the end of this year, has been adopted in the Soviet Zone Republic of Eastern Germany. According to this—in the view of experts a rather ambitious plan—the chemical industry is to raise its production by 82 per cent during the next five years.

Percentage Increases

The possible effects are characteristically obscure as, following the usual Soviet practice, the changes are shown as percentages of unknown figures. In detail, the projected output increases are as follows: nitrogenous fertilisers 18 per cent, phosphatic fertilisers 91 per cent, sulphuric acid 54 per cent, caustic soda 67 per cent, synthetic rubber 59 per cent, petrol 75 per cent, plastics 113 per cent, and Perlon 762 per cent. Considerably more chemical products are to be supplied to the rayon and soap industries, and it is officially stated that existing plant will have to be augmented if the targets are to be reached in 1955.

The high percentage increase projected in Perlon production is, of course, due to the fact that the present output is very small indeed. No exact quantitative figures have been released about the production of this or other chemical manufactures at present, but certain quantitative target figures have been produced in connection with the five year plan for 1955 as follows: 400,000 tons of sulphuric acid, 250,000 tons of caustic soda, 240,000 tons of nitrogenous fertilisers, 90,000 tons of phosphatic fertilisers, 60,000 tons of synthetic rubber, and 780,000 tons of motor spirit. It is, however, difficult to assess the significance of these figures.

Soviet Block Economy

While in general the Soviet zone Republic is expected to join more closely in the economic arrangements of the Soviet bloc in Eastern Europe, little has been said so far about commercial exchanges between Eastern Germany and other eastern countries in the chemical field. The East German fertiliser industry will presumably continue to receive apatite phosphates from Kola, coke and possibly benzol from Hungary. On the other hand, further efforts will probably be made to end, or at least alleviate, the dependence on chemical key products and intermediates from Western Germany. It is understood that several new intermediates are now being made at the chemical works at Wolfen.

The penicillin plant erected by Höchster Farbwerke under licence from Merck & Co., New York, is now in full production. About 400,000 million units a month can be produced at present, which is sufficient to meet all West German requirements. During an inspection by Mr. McClay, U.S. High Commissioner in Germany, on August 4 it was stated that the existing capacity could be doubled without great difficulty. Preparations are now under way at Höchst for the production of streptomycin. The cost of the penicillin plant is stated to have been Dm. 6.98 million, of which the company provided over two-thirds, relying for the rest on ERP counterpart funds and a loan from the U.S. Control Office.

The potash production in Western Germany during the April-June quarter did not maintain the high level of the January-March period. The monthly output rate fell from 76,500 tons (K_2O) to 68,200 tons. In the meantime, mining operations have been resumed in the " Riedel " works near Celle, where 100 workers are now producing 300-400 tons of sylvinite daily. Within the next twelve months the output is to be raised to 1500 tons daily and, in December, production is also to be resumed in the Königshall-Hindenburg mine. However, as the optimal potash consumption in West German agriculture alone is estimated at 900,000 tons (K_2O), the tonnage available for export will still be limited.

Ambitious Polish Programme

POLAND'S six-year plan for its chemical industry, which came into effect last year, calls for all-round increases in production, the largest of which include: sulphuric acid 191 per cent; fertilisers (nitrogen) 303 per cent; fertilisers (phosphates) 339 per cent; acetone 1304 per cent; synthetic rubber 2200 per cent; plastic materials and finished articles 1370 per cent.

Twenty-five new chemical factories are to be put into production by 1955. The manufacture of paints, dyes and colours, in particular, is to be developed.

In 1949 Poland's total chemical production was valued at 1126 million zlotys. By 1955 it is hoped that the total value will be 3750 million.

ITALY'S ESSENTIAL OIL INDUSTRY

A Survey of Modern Developments

THE importance to Italy of its essential oils industry, a reliable and increasing source of exports, has not had all the recognition it deserves, even in Italy. Many outside Italy made their first intimate acquaintance with that country's actual and potential capacity for the production of essential oils during the last International Chemical Congress in Barcelona, in the account then given by one of the principal authorities, Professor F. La Face, director of the Centro di Studio per le Essenze, which has now been reproduced in *La Ricerca Scientifica* (**20**, 6, 761-772).

The principal sources of essential oils in Italy are citrus fruits, especially the bergamot, also lavender and iris, and more recently the jasmin, which is grown on an increasing scale and contributes more and more largely to world perfumery markets. The fruits, which are found principally in Sicily and Calabria, account for the production of some 60,000 tons of essential oils per annum. Special attention is given to the bergamot, from which various grades of by-products or distillates are obtained.

These distillates are in addition to the main product obtained from the rind and differ in several respects from it. The output of distillates is relatively small, being 15-20 tons per annum. The well known petit-grain is obtained from the leaves. This has practically the same composition as its widely used namesake derived from the bitter orange, and the yield from bergamot leaves is rather better than from orange.

High Yield of Lemon Oil

Lemon oil is an important product in the citrus category and the yield from Italian lemons is relatively high, being 0.51-0.71 per cent on whole fruit, the average industrial yield being about 0.45 per cent compared with 0.2-0.3 per cent in the case of Californian or Palestine lemons. The citral content of lemon oil from Italian fruit is also higher than from Californian or Palestine lemons Here again petit-grain is distilled from the leaves.

The proportion of the total lemon crop destined for industrial purposes, e.g., the production of essential oil, varies from 20-80 per cent (of about 800,000 tons). Of the sweet orange crop the amount available for essential oil is regulated by demand for the fruit as such, or for the juice. Some oil is obtained from immature oranges; the yield in this case is relatively high and the quality more fresh and piquant. In Italy the use of the crop for oil has declined markedly, as compared with the production in Florida, French Guinea, Spain and other countries, namely from about 150 to 50 tons of oil, representing 4-5 per cent of the total crop.

The bitter orange is grown in Sicily and Calabria exclusively for oil production. An important product is neroli oil obtained from the flowers, of which 300-400 tons annually are collected for the purpose, and yield about 1 per cent of oil very similar to the French product: esters 7.7-14.7 per cent, total alcohols 57-63 per cent, methyl anthranilate 0.71-1.37 per cent. Bitter orange blossom is to a limited extent treated with volatile solvents, yielding 0.24-0.26 per cent of the concrete oil.

Ester Content of Petit-grain

Petit-grain obtained from the bitter orange leaves (0.2-0.3 per cent) has a rather high ester content, namely 55-65 per cent in steam distilled oil and 50-52 per cent by direct heat process. Oil is also obtained from the rind or peel, to the extent of 0.4-0.5 per cent. Little use is made of mandarin oranges in this industry. As is well known, the petit-grain from the leaves of these is remarkable for its high content of methyl anthranilate—up to 64 per cent.

The author deals at some length with various technical problems, more especially the wider use of machinery for some of the operations hitherto slowly and laboriously carried out by hand. As in other industries concerned with the recovery of plant products, a first essential is the effective cleaning and trituration or pulping of the raw material to fracture the cells and facilitate recovery of the desired product. In the Italian essential oil industry the two principal machines, of relatively simple yet effective operation, are the so-called *pelatrici* and *sfumatrici*. The former are scalpers or strippers in which the fruit is thrown by centrifugal force against abrading surfaces, usually glass; the latter are pulpers, by which the material, more particularly the rind, is

subjected to a rending and tearing action. The strippers are mostly used for bergamots and the pulpers for the other citrus fruits. In the case of bergamots, the first division of products, the operational programme, affords a crude aqueous oil emulsion on the one hand and fruit residue on the other. From the emulsion, through various operations of centrifuging obtained, and from the residue, by pressing, etc., are obtained pectin, cattle fodder, citric acid (or calcium citrate), alcohol and essential oil distillate.

Other oils include mint oils and lavender. The introduction of the Mitcham black mint variety some years ago considerably improved yields and quality. The menthol content of the Mitcham variety was up to 65 per cent. The total area under the crop, mostly in Piedmont, is about 1500 acres, and the output of essential oil some 30 tons a year. The lavender fields of Italy cover large areas in the Ligurian-Piedmontese uplands, up to about 20,000 acres, with smaller but more accessible fields in Calabria and other districts. Yields, however, are not very considerable, representing about 600 tons of the spikes from the uplands, 15 tons from Campana, and 60 tons from the Calabrian-Lucania zone. The yields of oil vary from 0.6 to 0.75 per cent, with ester contents from 18 to 40 per cent.

Increasing interest has lately been taken in jasmin cultivation, but this does not yet appear to have reached large proportions, the chief centres being in Sicily and Calabria. The yield of material is four-and-a-half tons per hectare and the total crop is about 500 tons. Extraction is usually by petroleum ether.

Another oil to which some interest attaches and for which conditions are said to be favourable is that of rose geranium. Among wild plants, besides lavender, there are several others that would probably be worth collecting for the stills if suitable organisation and marketing could be established, such as some varieties of thyme, calaminth (*C. nepeta*) and *Mentha pulegium*.

The author confirms that there are wide possibilities of various kinds for developing the essential oil and perfume industry in Italy. Natural conditions in many districts are favourable, but there is need of suitably located centres for study and research, testing and marketing. The two principal centres in Italy at present are the Centro di Studio del CNR (Nat. Research Council), of which the author is director, and the Stazione Sperimentale per l'Industria delle Essenze, Reggio Calabria.

Synthetic Fuels and Chemicals for the U.S.A.

CURRENT events, in which the campaign in Korea bulks large, and the increasing requirements in the U.S.A. for benzene and phenol have heightened interest in the Bureau of Mines investigation of these and other chemicals available in producing synthetic liquid fuels from coal and oil shale.

The major objective, which has enlisted the interest of the National Security Resources Board, is to determine the most desirable processes for producing chemicals in conjunction with synthetic fuels. Potential benefits would include the provision of a new source of those chemicals either in short supply now or expected to be in emergency; a supplementary source of aromatics of other special fuel components required by the armed forces; and reduction of the cost of synthetic liquid fuels by the co-production and sale of chemicals.

Benzene, already insufficient for current needs, constantly is becoming more important as a basic raw material. Its use in such products as synthetic rubber, plastics, nylon, and detergents readily accounts for the sharp increase in demand during the last decade.

Until recently, benzene was available only as a co-product in the manufacture of oven coke, used chiefly for metallurgical purposes. Thus, coke requirements established a ceiling on benzene production, and interruptions in either the coal or steel industry tended to create an immediate shortage with dislocations in dependent industries. For the first time, benzine is now being produced from petroleum at Texas City, Tex., where a plant has been established with an annual capacity of 5 million gall.

Benzene and the aromatic hydrocarbons generally, with phenol and other commercial "tar acids," can be produced in substantial amounts by the direct hydrogenation of coal—one of the synthetic liquid fuels processes being developed by the Bureau of Mines. Such production, while not a major programme objective, would offer a means of augmenting present and future chemical supplies, and also help reduce the liquid fuel costs.

A single commercial-scale coal hydrogenation plant, producing principally petroleum and liquefied petroleum gases, could make a major contribution in alleviating shortages.

OVERSEAS

New Glassware Factory for Israel

A factory for the manufacture of glassware is to be erected in Petah Tikva, Israel, for which investments are required of $100,000 and I£50,000, respectively. Reports from Israel also indicate that raw materials for the manufacture of glass, and pottery, which are now imported, have been recently discovered in the vicinity of Beersheba.

I.G. Holdings in Spain Expropriated

The I.G. participation in a Spanish chemical concern, Unicolor S.A. Colorantes y Productos Quimicos, has been expropriated by the Spanish Government, and sold to the Fabricación Nacional de Colorantes y Explosivos S.A. (FENCE) for 2,961,000 pesetas. The I.G. also owned 25 per cent of the share capital in FENCE which has also now been expropriated and sold for 13,455,000 pesetas.

ECA Funds for Oil Drilling

French oil companies have been allocated from ECA funds the sum of U.S. $1.3 million, to be used for the drilling of test wells in Morocco and Tunisia. Of this total, the Société Nationale des Recherches et d'Exploitation des Pétroles d'Algérie (REPAL) is to receive $720,000 and the Société Chérifienne des Pétroles $580,000.

Farben Equipment for Canada

Initial shipments of I. G. Farbenindustrie research equipment, awarded as war reparations to Canada by the Inter-Allied Reparation Agency, have arrived in the Dominion. Sixty-three crates of equipment have been received by the Polymer Synthetic Rubber Corporation from the dismantled I. G. Farben plant at Leverküsen, Germany. The equipment is reputed to be the finest in the world.

Shale Oil Refinery for Brazil

A refinery is being constructed at Pindamonhangaba, Brazil, for distilling oil products from bituminous shale mines in the Paraiba Valley, where large reserves are said to exist. The first retort has already been built and the plan for the complete plant provides for three groups each consisting of 16 such retorts. They will have a capacity of 1000 tons of shale per day, which is expected to yield some 100,000 litres of crude oil, besides a quantity of gas estimated to be sufficient for the requirements of the city of Sao Paulo and other towns in the Paraiba Valley.

Sulphur Concessions

The Mexican Gulf Sulphur Company has been awarded concessions by the Mexican Government, comprising 7500 acres, on two very large sulphur domes in the State of Vera Cruz, Mexico.

Indian Oil Seeds Industry

During the current year the production of oil seeds in India has been estimated at about five million tons, and its contribution to the national income at approximately Rs. 205 crores. The area under oilseeds in India is in the region of 28 million acres, out of a total gross cultivated area of about 276 million acres.

Canadian Lithium Source

Northern Chemicals, Ltd., is planning the erection of a 100-ton concentrator and power plant for its lithium deposit (spodumene) at Cat Lake, about 90 miles northeast of Winnipeg. An agreement has been completed with the Lithium Corporation of America, a substantial shareholder, for the sale of the first 15,000 units of concentrated ore annually.

Hong Kong Export Ban

Chemicals and some non-ferrous metal compounds are among the list of commodities of which the export from Hong Kong to Communist-controlled China has been stopped by the Hong Kong Government. Heavy buying at high prices of strategic materials by Chinese Government agents is reported to have been in progress for some time.

Chemical Fertilisers

Under the scheme of distribution of chemical fertilisers through co-operative societies in Madras State, the District Central Stores has taken over 80,000 tons of ammonium sulphate to be distributed to the ryots. Besides the wholesale stores, primary societies, market societies and other co-operative organisations will also distribute chemical fertilisers.

Magnesium Sheet Production Begins

Large-scale manufacture of magnesium sheets will be undertaken by the Dow Chemical Company in a 110-acre plant at Madison, Illinois, purchased from the U.S. Government for $1.5 million. It will be the first in the United States to make continuous rolled magnesium sheets. Military demands for sheet magnesium have increased greatly in the past month; magnesium is now replacing aluminium in aircraft and zinc in batteries.

PERSONAL

DR. E. J. HOLDER has been appointed to the board and to be general manager of Duncan, Flockhart & Co., Ltd.

DR. W. J. F. CUTHBERTSON, head of the nutrition unit, research development division, Glaxo Laboratories, Ltd., presented a paper "The Microbiological Assay of Vitamin B_{12}" at the pharmaceutical conference held at Verona, Italy, recently.

In the course of a recent visit to the U.S.A., DR. V. PETROW, chief research chemist to the British Drug Houses, Ltd., gave a lecture on "The Chemistry of Vitamin B_{12}" to the Gordon Research Conference, organised by the American Association for the Advancement of Science. He described the work carried out by the B.D.H. Research Laboratories in collaboration with Dr. Holiday and his colleagues of the MRC Spectrographic Unit of the London Hospital.

MR. DAVID RITCHIE, of T. & H. Smith, Ltd., Blandfield Chemical Works, Edinburgh, has received the degree of doctor of philosophy of the University of Edinburgh. The title of his thesis was "Synthesis of Pyrazoline Derivatives and an Examination of their Local Anaesthetic Activity."

MR. G. E. WATSON, who was manager of the vitamin oils department of the Crookes Laboratories, Ltd., has been appointed general manager in place of DR. J. C. BURGIN who is leaving England for Australia. MR. E. A. RANKIN has been appointed manager of the vitamin oils department, of which MR. E. H. HOPKINS becomes technical manager.

MR. FRANK C. COOPER, assistant lecturer in pharmaceutical chemistry at Nottingham University, has been awarded the degree of Ph.D. of the university, the title of his thesis being "The Synthesis of Amidine Derivatives of Potential Antituberculous Activity."

Obituary

The death is announced, at the age of 45, of DR. OTTO A. BEECK, associate director of research, Shell Development Co., Emeryville, California.

ETS to Visit Holland

A joint meeting of the Electrodepositors' Technical Society and Studiekring Galvanotechniek (Dutch Electroplaters' Society) has been arranged for September 27-30. The programme will include two technical sessions, at which Dutch and British authors will present papers.

WELDERS' TRAINING COURSE

THE British Oxygen Co., Ltd., opened its Scottish school at Hillington, Glasgow, on August 7, and is already handling a considerable number of inquiries for training facilities. The school is designed to assist users of welding plant to achieve the maximum efficiency from plant and labour by training operators to a given standard of efficiency. Work covered by the school includes argon arc technique (of particular interest in view of the current expanded use of aluminium in the industry) all forms of oxy-acetylene welding, all forms of oxygen cutting, by hand or by machine and the ancillary processes utilising gas.

Individual firms are being invited to send workers for training to specific standards in the precise type of work which interests them. They are given a course of training, covering from two to ten weeks according to the nature of the work. Their progress is logged and reported.

OEEC Aluminium Mission

AN OEEC mission of experts from the United Kingdom, Austria, Belgium, Eire, France, Germany, Netherlands and Norway left Europe on Wednesday (August 16) under the technical aid scheme to study the recovery and use of secondary aluminium in the U.S.A. Representatives on the mission of the U.K. aluminium industry are: Mr. F. Farenden (Eyre Smelting Co., Ltd., Merton Abbey), Dr. E. Scheuer (Inter-Alloys, Ltd., Aylesbury) and Mr. R. Jones (High Duty Alloys, Ltd., Slough).

During approximately five weeks in the U.S.A. the party will study the segregation, collection and grading of aluminium scrap; the analysis, remelting and refining of scrap; and the use of scrap and of remelted secondary metal in the manufacture of cast products and of rolled, extruded and forged products.

Next Week's Events

SATURDAY, AUGUST 19

Institute of Mining and Mechanical Engineers

Newcastle upon Tyne: Lecture Theatre of North of England Institute of Mining and Mechanical Engineers. 2.30 p.m. "Third Report of the Shot-firing and its Alternatives Committee," introduced by Major R. S. McLaren, D.S.O., M.B.E., B.Sc.

International Union of Biological Sciences

Rio de Janeiro: 5th International Congress of Microbiology.

• HOME •

Barrier Creams

Rozalex, Ltd., Manchester, is to show on Stand 19 of the Laundry, Dry Cleaning & Allied Trades' Exhibition at Olympia (September 28 to October 7) a full range of dermatitis barrier preparations.

Prices of Oils and Fats

There will be no change in the prices of unrefined oils and fats and technical animal fats officially allocated to primary wholesalers and large trade users during the four-week period ending September 2. The Ministry of Food adds, however, that stocks of rapeseed oil are now exhausted and the published prices of £140 and £130 per ton have been withdrawn.

Home-Grown Linseed

Apart from sales for seed, which are not controlled, sales of home-grown linseed during the rest of the year must be to an approved buyer or direct to the local branch of the National Association of U.K. Oil and Oilseed Brokers, Ltd. The growers' price for linseed sold for crushing will again be £55 per ton net weight *ex* farm, on a basis of 90 per cent purity, with an increase or decrease of 12s. 3d. per ton for each 1 per cent variation.

New Nickel Alloy

The Mond Nickel Co., Ltd., announces the addition of Nimonic 90 nickel alloy to its commercially available alloys. Nimonic 90, used in gas turbine blade construction, was found to be 10 per cent better than Nimonic 80 A at 750° C. and similar superiority was observed at the higher temperature ranges. Information about the metal, in the development of which Henry Wiggin & Co., Ltd., collaborated, has hitherto been withheld for security reasons.

Continued Rise of Lead and Tin Prices

The continued trend to higher costs for non-ferrous metals has been confirmed by further higher quotations—notably for lead and tin—in the past few days. The Ministry of Supply price for good soft pig lead was raised on Wednesday by £8 to £104 per ton delivered. A rise in the charge for 99.6 per cent antimony advanced the rate from £160 to £170 per ton. The relatively meagre offering of tin on the London Metal Exchange on Tuesday influenced a further advance of £18 in the price for supplies three months hence—to £838-840 per ton.

Progress at Engineering Research Centre

Substantial progress is reported to have been made on the large DSIR Mechanical Engineering Research Station at East Kilbride. The steel structure of the first two buildings has been completed and ancillary buildings are steadily rising. Plans are now in hand for a third building.

New High Vacuum Grease

Shell Chemicals, Ltd., announces that supplies of its product Apiezon Grease "T" are now available. This grease, which is another addition to the company's range of Apiezon oils and greases for high vacuum work, has a melting point of 125°C. and a vapour pressure of approximately 10^{-8} mm. Hg. at room temperature.

To Study U.S. Metal Finishing

A team of specialists left England last week for the U.S.A. to study American methods of metal finishing, including technical anti-corrosion processes. The team of 13 has as the secretary Mr. R. A. F. Hammond, of the Ministry of Supply's Armament Research Establishment, Woolwich.

£2.5 m. Cement Works Scheme

A public inquiry has been held at Cheadle, North Staffordshire, by the Ministry of Town and Country Planning into the proposed siting by the British Portland Cement Manufacturers, Ltd., of a £2.5 million cement works at Cauldon. The project, which was approved by the Cheadle council, is expected to contribute an additional output of 7000 tons a week.

Atomic Power for Ships

A contract for drawings and costings of a prototype atomic power unit which could be applied to large merchant ships and warships has been placed by the Government with an engineering firm. Such work is considered necessary before any decision could be made on the possibilities of adapting atomic power for ship propulsion.

Chemical Company Moving

Consolidated Chemicals, Ltd., is to transfer its business from Bury St. Edmunds to Wrexham Trading Estate next month. Work will be found at Wrexham for about 50 people, mainly women, and about a dozen of the present clerical and technical staff will be transferred. Mr. C. D. Jenkins, managing director, states that the difficulty in obtaining staff induced the company to seek the better facilities at Wrexham.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

J. C. ARNFIELD & SONS, LTD., Stockport, chemists. (M., 19/8/50.) July 17, deed dated July 12, 1950, securing £250,000 first deb. stock of James Woolley & Sons & Co., Ltd., together with a premium of up to 5 per cent payable in certain events; general charge. *Nil. Nov. 17, 1949.

BROWNS CHEMISTS (STOKE-ON-TRENT), LTD., (M., 19/8/50.) July 14, £4000 mort. to Tunstall Building Soc.; charged on 21 Market Street, Longton, Stoke-on-Trent. *£3,820. Jan. 3, 1947.

CLAY & SON, LTD., London, E., dealers in manures and horticultural sundries, etc. (M., 19/8/50.) July 12, letter of irrevocable authority securing to Midland Bank, Ltd., all moneys due or to become due to the Bank; charged on certain moneys. *£6000. Oct. 15, 1947.

JOHN E. MOORE, LTD.. Yeadon, metallurgists, etc. (M., 19/8/50.) July 15, £4,500 charge, to J. E. Moore. Masham, and £7500 (not ex.) charge, to Westminster Bank, Ltd.; both charged on land at Cemetery Road, Yeadon, with buildings etc., known as Lakeside Works. *Nil. Dec. 28, 1948.

OAKES EDDON & CO., LTD., Liverpool, laboratory furnishers, etc. (M., 19/8/50.) July 12, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on 97 Prescot Street, West Derby, Liverpool, with machinery, fixtures, etc. *£260. Mar. 3, 1950.

L. M. WELSH, LTD., Hinckley, chemists, etc. (M., 19/8/50.) July 7, £1400 charge to Hinckley and Leicestershire Building Soc.; charged on 119 Priesthills Road, Hinckley. *Nil. Aug. 5, 1949.

EDWARD WIGGINS & CO., LTD., London, E., manufacturing chemists. (M., 19/8/50.) July 5, £6000 charge, to S. H. Bean, London; charged on The Hollies, Mill Hill Village, Hendon. *Nil. May 22, 1950.

JAMES WOOLLEY SONS & CO., LTD., Salford, chemists, etc. (M., 19/8/50.) July 17, Trust deed dated July 12, 1950, securing £250,000 deb. stock with a premium of up to 5 per cent charged on specified properties at Salford, Manchester and Oldham; and a general charge. *Nil. Oct. 26, 1949.

Satisfactions

CHINNOR INDUSTRIES, LTD., (formerly Chinnor Cement & Lime Co., Ltd.), London, E.C. (M.S., 19/8/50.) Satisfaction July 20 of deb. stock reg. Oct. 30, 1936, to the extent of £1731.

STEWARTS & LLOYDS, LTD., (M.S., 19/8/50). (Incorporated in Scotland). Satisfaction July 19, of deb. stock reg. Feb. 8, 1934, to the extent of £21,700.

Increases of Capital

The following increases in capital have been announced: British Resin Products, Ltd., from £1.5 million to £2.25 million; F. W. Berk & Co., from £300,000 to £340,000; John Poynter, Son & MacDonalds, Ltd., from £30,000 to £75,000.

Change of Name

The name of WILTON ROW EXTENSIONS, LTD., has been changed to MENROW PUMPS, LTD.

Company News

International Nickel Co. of Canada, Ltd.

Net earnings of the International Nickel Co. of Canada, Ltd., in terms of U.S. currency, in the first six months of this year were $20,385,591, equal to $1.38 per share on the common stock, compared with $20,983,417, or $1.37 per common share, in the corresponding period of 1949.

Manchester Oil Refinery, Ltd.

Declared interim dividend of 10 per cent (less tax) on its £325,000 ordinary stock for the year ended December 31, 1950.

New Registration

Arthur Bedwell & Co. (Hygiene Division), Ltd.

Private company. (485,158). Capital £1000. Distributing agents and sellers of sterilising and detergent substances, etc. Directors: A. Bedwell, J. H. Hinds, and A. J. Bedwell. Reg. office: 438/442 Barking Road, E.13.

The Stock and Chemical Markets

LED by British Funds and commodity shares, stock markets have maintained a better trend and supported business on a somewhat higher scale. It is considered that fresh taxation to pay for rearmament is likely to be left until the April Budget and the belief has helped market sentiment, although it is realised that such factors as the rising cost of materials, may, if continued, compel companies to raise more money to finance higher stocks.

Companies which can either directly or indirectly contribute to the arms drive appear to have excellent prospects of maintaining profits. Companies whose earnings depend largely on public spending power may have a difficult period ahead. It is hardly surprising that buying of industrial shares is very selective.

The chemical and kindred sections have shown movements in favour of holders. Imperial Chemical have rallied further to 42s. 3d. at the time of writing, the prevailing view being that there are reasonable prospects of the 10 per cent dividend being held. Armament and kindred work could offset any falling off in other sections of the group's activities. Monsanto changed hands around 49s., Fisons were better at 26s. 9d., while Albright & Wilson have risen sharply to 31s. 3d. Brotherton 10s. shares have kept at 20s., Laporte Chemicals 5s. units were 10s. 3d., Lawes Chemical also 10s. 3d., and Boake Roberts 28s. 9d., and W. J. Bush 81s. 3d. Elsewhere, Amber Chemical 2s. shares were 3s., F. W. Berk 2s. 6d. shares 10s. 3d., Bowman Chemical 4s. shares 5s. 3d. and Pest Control 5s. ordinary 6s. 9d. L. B. Holliday 4½ per cent preference were 19s. 6d., British Chemicals & Biologicals 4 per cent preference 17s. 8d. and Wolley 4¾ per cent debentures 104½.

The 4s. units of the Distillers Co. have kept steady at 18s. 7½d., United Molasses also improved to 42s. 9d. and United Glass Bottle at 75s. remained a very firm feature. Triplex Glass 10s. units, awaiting the financial results, have shown continued activity around 24s. Turner & Newall at 80s. 6d. were firmer, British Aluminium strengthened to 40s. 3d. and Borax Consolidated at 54s. 6d. have again held up well.

Fears that rearmament may check any expansion of house building next year kept a number of shares quiet, including Associated Cement at 83s. 6d. British Plaster Board 5s. units were 14s. 6d. Iron and steels again showed further activity with armament and kindred shares. United Steel were 28s. 4½d., Firth Brown 73s. 9d. and John Summers 31s. 9d. Elsewhere, Staveley were 78s. 3d. and Powell Duffryn 29s. 1½d.

Boots Drug further strengthened to 48s., Glaxo Laboratories were 46s. 3d., Sangers 21s. 6d., Beechams deferred 12s. 9d. and Griffiths Hughes 21s. British Glues & Chemicals 4s. shares have been firm at 24s. 6d. xd. There was a firmer trend among shares of companies connected with plastics, De La Rue being 24s. 3d., British Xylonite 75s., British Industrial Plastics 2s. shares 5s. 3d. and Kleemann 1s. shares 7s. 7½d. Oils were slightly more active, although best levels were not held. Anglo-Iranian came back to £5¾, Shell were 62s. 6d., and Trinidad Leaseholds 24s.

Market Reports

TRADING conditions on the industrial chemicals market continue more or less as reported last week; actual movements have been restricted by seasonal influences. Interest in forward business is again widespread and the undertone throughout the market is firm. The better conditions which have recently returned to the coal tar products market have been fully maintained and bookings for forward delivery have represented good volumes. Prices throughout are steady.

MANCHESTER.—Trading conditions during the past few days have been more active. There has been a good aggregate demand for the soda compounds against existing commitments, also a steady call for potash chemicals and ammonia and magnesia products. There has been a welcome increase in new business, on both home and export account. A fair trade has been in evidence in light and heavy tar products. A general firmness of the market has been fully maintained.

GLASGOW.—There has been a slight falling off in orders during the past week owing to the fact that many English suppliers were closed down for annual holidays, and customers, aware of this, were not calling forward supplies. The export market is becoming more difficult each day as the international situation depreciates.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Amides and their sulphonated derivatives.—Nopco Chemical Co. Feb. 13 1948. 642,836.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., J. T. Richmond, G. G. Durrant, and R. J. Wigginton. Dec. 15 1946. 642,979.

Process for printing or dyeing superpolyamide fibres.—Ciba, Ltd. Feb. 20 1948. 642,837.

Process and apparatus for the manufacture of fertilisers.—J. Balfour & Co., Ltd., J. H. Balfour, W. R. Normand, and A. M. Cameron. March 3 1949. 642,795.

Polmerisation of 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. March 24 1948. 642,799.

Polymeric 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. March 24 1948. 642,800.

Polymerisation of 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. April 14 1948. 642,983.

Acyl polyalkylene-polyamine biguanides.—General Aniline & Film Corporation. April 29 1948. 642,989.

Diazotype photoprinting materials stabilised with sulpho amino benzoic acids. —General Aniline & Film Corporation. May 7 1948. 642,992.

Electrolytic processes in particular processes for the electrolytic production of fluorine.—Imperial Chemical Industries, Ltd., W. N. Howell, and H. Hill. May 13 1949. 642,812.

Alkyl-substituted halogenosilanes. — British Thomson-Houston Co., Ltd. May 19 1948. 642,997.

Electrically-insulating coating compositions.—Indestructible Paint Co., Ltd., C. R. Pye, and H. F. Bremer. May 13 1949. 642,816.

Electrically-insulating coating compositions.—Indestructible Paint Co., Ltd., C. R. Pye, and H. F. Bremer. May 13 1949. 642,817.

Preparation of biguanide derivatives.—Soc. Des Usines Chimiques Rhone-Poulene. May 28 1948. 643,000.

Fusion-deposition welding.—Linde Air Products Co. July 8 1948. 642,854.

Preparation of foraminate catalysts.—Imperial Chemical Industries, Ltd., P. W. Reynolds, and R. L. Robinson. Aug. 10 1949. 642,861.

Methods for soldering aluminium or aluminium alloys and soldering materials therefor.—Pirelli-General Cable Works, Ltd. Sept. 14 1948. 642,869.

Phosphors.—Marconi's Wireless Telegraph Co., Ltd. Nov. 14 1944. 642,701.

Method and apparatus for making a fabricated sheet of unspun fibres.—Fibre Products Laboratories, Inc. July 15 1946. 642,890.

Moisture-resistant coating and method of producing it.—Western Electric Co., Inc. Aug. 1 1946. 642,892.

Process for the production of sterols from oils, fats and fatty acids.—Severoceske Tukove Zavody (Drive Juri Schicht) Narodni Podnik. Nov. 20 1946. 642,714.

Process for the manufacture of fatty acids of high melting point from waste fatty substances.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Nov. 20 1946. 642,715.

Method for the extraction of nucleic acid. —M. A. E. Assada. Nov. 26 1946. 642,716.

Production of alumina.—Aluminium Laboratories, Ltd. Jan. 2 1947. 642,943.

Method of pyrogenetically treating a mixture of combustible and non-combustible material and a furnace therefor. J. E. Greenawalt. Jan. 8 1947. 642,898.

Process for the esterification of fatty acids with low-molecular univalent alcohols.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Jan. 16 1947. 642,718.

Glassy phosphate powder compositions and process of making the same.—Albright & Wilson, Ltd. Feb. 28 1947. 642,944.

Glassy phosphate powder compositions and process for making the same.—Albright & Wilson, Ltd. Feb. 28 1947. 642,945.

Gas analysers.—C. A. Parsons & Co., Ltd., and A. E. Martin. Jan. 28 1948. 642.725.

Manufacture of isopropyl alcohol.—Distillers Co., Ltd., J. Howlett, and W. L. Wood. April 1 1948. 642,905.

Process for the conversion to sulphur and/or sulphur dioxide of other sulphur compounds and catalysts therefor.—K. Williams. April 9 1947. 642,726.

Manufacture of moulded articles from materials containing cold-swelling starch. —N.V. W. A. Scholten's Chemische Fabrieken. April 14 1947. 642.906.

Method of removing chlorate substances from alkali metal hydroxides.—Diamond Alkali Co. April 15 1947. 642,946.

Sulphonated 1, 8-di (nitrophenyl) triazenes.—General Aniline & Film Corporation. April 16 1947. 642,947.

Process and apparatus for the cooling of molten lubricating greases.—N.V. De Bataafsche Petroleum Maatschappij. May 2 1947. 642,948.

Manufacture of coloured photographic layers.—Gevaert Photo-Producten N.V. May 13 1947. 642,728.

Process for preparing benzodioxane derivatives and the product resulting therefrom.—A. H. Stevens. (Monsanto Chemical Co.). May 20 1947. 642,949.

Packages for use in liquid purification.—American Cyanamid Co. May 23 1947. 642,732.

Process for the preparation of alkanolamines.—Soc. Carbochimique Soc. Anon. June 25 1947. 642,950.

Processes of producing condensation products of phenols and process of preserving rubber.—Monsanto Chemical Co. July 10 1947. 642,827.

Process for the removal of silica from an aqueous fluid.—American Cyanamid Co. July 30 1947. 642,951.

Soapless detergents mixed with triphosphates as builders.—Procter & Gamble Co. Aug. 1 1947. 642,921.

Luminescent materials.—Sylvania Electric Products, Inc. Aug. 5 1947. 642,742.

Convertible alkyd resins.—N.V. De Bataafsche Petroleum Maatschappij. Nov. 26 1947. 642,828.

Porous pots for primary electric cells.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd., Hawley Products, Ltd., W. W. Puffet, and A. Lewin. Aug. 30 1948. 642,744.

Filter for purifying a liquid or gaseous fluid.—J. Depallens. Sept. 9 1947. 642,748.

Process for preparing reaction products of natural rubber or synthetic rubber-like materials with sulphur dioxide.—Rubber-Stichting. Oct. 3 1947. 642,959.

Lubricating composition.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 6 1947. 642,960.

Infra-red gas analysing apparatus.—C. A. Parsons & Co., Ltd., and A. E. Martin. Oct. 6 1948. 642,750.

Continuous bleaching of glyceride oils.—Procter & Gamble Co. Oct. 16 1947. 642,751.

Method of producing pinacols.—White Laboratories, Inc. Oct. 24 1947. 642,752.

Process for the manufacture of olefin oxides.—R. S. Aries. Oct. 28 1947. 642,961.

Repeatedly ignitable composition rods.—F. K. Knutsson-Hall. Nov. 7 1947. 642,754.

Preparation of acetals.—General Aniline & Film Corporation. Dec. 8 1947. 642,880.

Process of brazing austenitic ferrous metals and articles produced thereby.—Ford Motor Co., Ltd. Dec. 18 1947. 642,768.

Stabilisation of tetrahydrofuran.—E. I. Du Pont de Nemours & Co. Dec. 19 1947. 642,969.

Refining of oils and motor fuels.—Refiners, Ltd., and T. Scott. Nov. 29 1948. 642,772.

Process for the production of a catalyst.—Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. Dec. 23 1947. 642,970.

Process for preparing metals powders for the purposes of powder metallurgy from copper and iron containing ores.—D. Primavesi. Dec. 29 1947. 642,773.

Nitriles and method of preparing same.—Resinous Products & Chemical Co. Jan. 1 1948. 642,930.

Apparatus for and method of applying protective coating material to the inside of a pipe or the like.—Dearborn Chemical Co. Jan. 8 1948. 642,777.

Production of potentially heat reactive thermosetting resins and infusible resins and resinous products obtainable therefrom.—Harvel Research Corporation. Jan. 20 1948. 642,780.

Retardation of development of reversion flavour in hydrogenated fats and oils.—Procter & Gamble Co. Feb. 7 1948. 642,977.

Germanium dry rectifiers and detectors.—Sperry Gyroscope Co., Inc. June 4 1945. 643,200.

The
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A Verdict on Antihistaminics

INCONCLUSIVE results are no novelty in the experience of those engaged in the fundamental branches of chemistry and not every research project by those concerned with applications produces an answer firmly affirming or negativing the theory. Chemists belonging to both schools may well be congratulating themselves —if they have stopped to think about it—on the degree of precision which characterises most of their investigations compared with the uncertainties which distinguish the work of medical scientists. That truism has been rendered more obvious than ever by the recent findings by the Medical Research Council on the ineffectiveness of some familiar antihistaminics as cold cures and by the unpredictable factors which had to be tolerated in the course of those researches.

The results, which the British Medical Journal (*4676*, 425-430) presents in detail, appear to controvert in the most decisive terms the effect of responsible research on the same subject, of which the most widely known was the work done in the U.S.A. (THE CHEMICAL AGE, *62*, 576). The MRC has shown beyond doubt that, so far as clinical evidence gathered under carefully controlled conditions can establish, some of the most widely used antihistaminic preparations have no power at all to ward off the onset of the all too common cold and little or no capacity to reduce its duration once the attack has begun. That conclusion cannot be evaded in the light of evidence now presented. It is almost equally certain that thousands who have pinned their faith to one or other of the antihistaminics will continue to take them and that there will be just about as many " cures " as there were in the past.

The explanation of that apparent absurdity is perhaps supplied by what the MRC calls "psychogenic factors," which have their origin in the misty, ill-defined regions to which applied psychology and similar " sciences " belong. Chemists who deal only with inaminate material may be thankful they have not to take such unknown quantities into account. The complications to which they give rise were evidenced several times in the course of the MRC tests, carried out in one instance on 1550 people in different parts of the country, of whom a substantial number, the " controls " perversely reported the onset of symptoms associated with the effects of drugs they had not received. None of these things, however, discredits the fact that the results presented by D. M.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Brewster of tests carried out in an American navy hospital (*U.S. Nav. Med. Bull.*, 1947, *47*)—which was the genesis of a good deal of confirmatory work and finally of sales of antihistaminics in the U.S.A. of the estimated value of about $100 million a year—are quite unreliable for general application. That will not come as a surprise to the American Medical Association, which had already concluded that the value of antihistaminic drugs as cold cures—of which thousands in America were convinced—could not be evaluated until "a scientifically acceptable study" had been performed.

The service which the MRC has rendered in this regard, which incidentally confirms some independent studies of the same kind in the U.S.A., was provided by two series of tests. In one, at the Common Cold Research Unit at Salisbury, volunteers were treated, before and after inoculation with cold virus, with Histantin (chlorocyclizine hydrochloride) or Phenergan (promethazine hydrochloride). An equal number of "controls" were given dummy tablets, and none of those concerned in these or the larger tests in various parts of the country knew who had received the antihistaminic and who had not. Preconceived ideas had no bearing on any of the results.

In the small-scale test at Salisbury the incidence of colds was precisely the same among those who received Histantin as those who took "control" tablets. In the Phenergan group the "controls" at one stage developed fewer colds than those who were treated. The test in which 1550 were concerned employed thonzylamine and showed that, apart from a very slight improvement at the end of one day's treatment, which was not apparent thereafter, the drug "has little if any value in the treatment of the common cold." At the end of a week those untreated reported 1.3 per cent more cures or improvements than did those who received the drug (71.4 per cent and 70.1 per cent).

Force is added to both these somewhat surprising verdicts on specific members of the antihistaminic group by another independent study (G. Lorriman and W. J. Martin) of Antistin. The results showed, broadly, that this drug had no more recognisable effect on the course of the common cold than any of the others.

Notes and Comments

Chemical Exports

THE total of British exports in July was £182,258,318, but this high level was not uniform over the whole field. Exports of chemicals, including drugs and dyestuffs, at £9,319,269, constituted a record. This compares with £6,434,589 in July last year. A record value was also achieved in the non-ferrous metals group, July exports here amounting to £7,366,809, against £4,539,070 in July, 1949. This substantial increase was largely due to the exceptional buying by the U.S.A. of tin from the Ministry of Supply's stock. The figure for July exports of unwrought tin (blocks, ingots, bars and slabs) was 3092 tons, against 311 tons in July last year, of a value of £1,962,985 (£178,609 in July, 1949). Of this total 2106 tons went to the U.S.A. (value £1,360,599) compared with 193 tons in July last year (value £111,625).

Progress of Science

THE announcement that *The Times* is to publish a second survey of the progress of science is one which merits the attention of all concerned with scientific topics. There is much to be said for this high endeavour on the part of a leading newspaper to present, in the form of a supplement, a group of articles dealing with the latest developments and research in the fields of pure and applied science. Written wherever possible in non-technical language these articles will fulfil several functions. For the specialist worker they provide an outline of work being carried out in fields far removed from his own and give perspective to his particular topic. The industrialist will be able to survey trends in the fields immediately relevant to his own. The student and the teacher can derive benefit from the articles which will allow them to correlate academic teachings with industrial and research techniques. To the layman, on the threshold of the subject, with much enthusiasm but little knowledge, the survey will be a symposium of fascinating scientific topics in which he should find much of interest. For everyone the supplement will delineate the directions in which scientists are progressing and give a measure of the extent to which the horizons of ignorance are being steadily pushed back.

Hidden Danger

THE panel which is now studying the toxic risks to man associated with the use of some agricultural chemicals will do well not to overlook the heightened danger presented by the fact that the effect of several of them is cumulative and there is at the outset no danger signal for the uninitiated. The force of that is emphasised by the data which a physician and a biochemist at Worcester (L. H. Milles and H. B. Salt) have collated of a specific case in which the organic phosphorus-compound Parathion was concerned. Their report (*The British Medical Journal, 4676,* 444) discloses in particular the suddenness and comparative violence with which the toxic effects manifest themselves after a period in which apparent immunity may well encourage the taking of risks. In this case, of a man of 46 whose work was to prepare a fairly dilute solution (2403/500 gall.) of 20 per cent Parathion for spray tankers for the hopfields, there seems to have been no foolhardy disregard of the risk. The apparent cause of the Worcester incident was the spilling of one drop of the 20 per cent insecticide on the forearm of the man, who washed it off 30 seconds later. Although a weal appeared within a few minutes there were no serious effects until nearly six hours after. Severe head and abdominal pains, vomiting and unconsciousness all occurred soon after that. Expert treatment (with heavy dosage of atropine sulphate) at the local hospital saved the situation, and very

probably the man's life. He was discharged five days later. The important fact in this case is that he had been doing this work for three weeks before the "cumulative" splash produced the unexpected retribution.

Scientific Jargon

THE multiplicity of scientific subjects, papers on which are planned to be read and discussed at the annual meetings of the British Association for the Advancement of Science due to commence next Wednesday (August 30), draws attention to the plea, made repeatedly and regularly through the ages, that such discourses should be as plainly worded as possible and should aim to explain and not to bewilder. The very titles of some of the papers this year, as, in fact, every year, leave a doubt in one's mind whether simplicity, for the benefit of visitors to the conference, is at all practicable. Authors and speakers need not, however, have any fear that their efforts will not compare favourably in this respect with those of their predecessors at British Association meetings. The *Birmingham Post* quotes one of the speakers, at a meeting of the association in Leeds some years ago, as having disemburdened himself of this: "As regards the fringe of the cilia of the œdogoniaceous swarmer, which is supposed to have been a feature of the flagellate ancestry of the stephanokontæ, cilial numbers other than the usual two or four are not unknown as motile volvocales." He was followed by another who observed: "The unbranched and the branched filamentous habits are met with in both classes, while the Cœnecytic botrydium is now clearly established as a siphoneous variant of the heterkontan analagous to protosiphon among the isokontæ."

Special Cements

BRITAIN'S much maligned climate used to save manufacturers many of the problems caused by extremes of temperature and humidity. Now that emphasis is on exports to all parts of the world that relatively care-free situation has ended. "Climatic" problems are arising where they did not exist before. Research workers have been called upon to solve such diverse problems as the rotting of leather in Burmese jungles, the warping of book covers in extreme conditions of relative humidity, and the breakdown of electrical equipment in the tropics. A specialised example of the way in which research is overcoming such difficulties is associated with the expanding export of optical instruments to the Far East. Manufacfacturers have had to provide, among other things, optical cements which are stable under extreme conditions of temperature and humidity. Canada balsam is still widely employed but becomes viscous on high temperatures and is too brittle at low temperatures for Arctic use. The search for a perfect substitute is, appropriately, the current responsibility of the British Scientific Instrument Research Association, which since 1918 has been actively concerned with the development of optical cements. Though a material capable of meeting all requirements has yet to be discovered, progress is indicated by the fact that nowadays optical instruments are operating efficiently in all parts of the world and under very exacting conditions. This, of course, is only one of the many directions in which science is assisting the export drive, but is certainly not of negligible importance in view of the growing value of instrument exports.

Acute Drug Shortage in Ceylon

THE continuing acute scarcity in Ceylon of drugs like penicillin, streptomycin and certain sulpha drugs has arisen largely as a result of the indents for these drugs not having been placed in time when available stocks were running low.

The Government Medical Stores asked for an indent of one million rupees worth of drugs to be placed with the Crown Agents in England four or five months ago, when it was realised that the existing stocks were inadequate to last till the end of the financial year.

Indents are stated to have been delayed until some weeks ago. Efforts have been made to get these drugs dispatched early.

RECORD CHEMICAL EXPORTS

July Totals Exceed £9 m.

THE chemical industry achieved a new record last month, the total value of exports, including drugs, dyes and colours, amounting to £9,319,269 compared with £6,434,589 in July last year, and £7,580,839 in the same month of 1948.

Notable increases were ammonium sulphate £871,908 (£532,867); the lead compounds: lead acetate, etc., £58,126 (£30,971) and tetra-ethyl lead £427,503 (£221,291); nearly all the sodium compounds again showed rises, and zinc oxides totalled £101,789 (£51,023).

Non-ferrous metals were also marked by a notable increase with a total of £7,366,809 against £4,539,070 in 1949.

EXPORTS

	July, 1950	July, 1949
	Gal.	Gal.
Cresylic acid	283,227	67,351
	Lb.	Lb.
Salicylic acid	102,548	85,078
Value of all other sorts of acid ...	£166,120	£98,336
	Tons	Ton
Sulphate of alumina	3,152	2,718
All other sorts of aluminium compounds	1,232	1,429
Ammonium sulphate	43,446	27,895
Ammonium nitrate	3,399	3,216
All other sorts of ammonium compounds	2,420	1,265
	Cwt.	Cwt.
Bleaching powder	20,344	19,429
All other bleaching materials ...	11,680	9,073
Collodion cotton	966	1,741
	Tons	Tons
Copper sulphate	4,337	4,402
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	41,586	39,909
	Tons	Tons
Fertilisers	1,785	2,317
Value of gases (compressed, liquefied or solidified)	£31,495	£23,087
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	10,723	5,680
	Gal.	Gal.
Tetra-ethyl lead	206,408	152,142
	Tons	Tons
Magnesium compounds	886	904
	Cwt.	Cwt.
Nickel salts	4,978	5,990
Potassium compounds	7,661	5,325
	Tons	Tons
Salt	19,614	17,767
	Cwt.	Cwt.
Sodium carbonate	379,302	266,694
Caustic soda	256,421	215,571
Sodium silicate	22,852	24,001
Sodium sulphate	88,402	62,036
All other sodium compounds ...	79,948	61,707
	Gal.	Gal.
Tar, creosote oil, anthracene oil, etc.	3,797,694	3,011,191
	Tons	Tons
Zinc oxide	1,203	668
Total value of chemical manufactures (excluding drugs and dyestuffs)	£5,649,782	£3,560,644
Value of quinine and quinine salts	£26,677	£38,894
	Lb.	Lb.
Acetyl-salicylic acid	227,601	103,639
	100 International Units	100 International Units
Insulin	585,385	612,891
	Mega Units	Units
Penicillin	1,204,243	564,271
Total value of drugs, medicines and preparations	£1,872,223	£1,158,384
Total value of dyes and dyestuffs	£691,319	£935,133
Total value of paints, pigments, colours, etc.	£1,105,945	£780,428
Total value of chemicals, drugs, dyes and colours	£9,319,269	£6,434,589
Plastic Materials:	Cwt.	Cwt.
Synthetic resins, solid and liquid, including adhesives ...	27,888	15,129
Moulding powders:	20,521	6,381
Sheet, rod, tube, film and foil—		
Laminated	2,652	1,777
Non-laminated		
Acrylic	2,852	1,724
Celluloid	977	545
All other sorts	4,719	2,143
Total value of all plastic materials	£755,896	£330,977
	Cwt.	Cwt.
Chemical glassware	1,530	738
Value	£64,428	£30,850
	Cwt.	Cwt.
Fans	3,658	3,942
Value	£92,247	£104,986
	Cwt.	Cwt.
Furnace plant	6,291	6,572
Value ...	£68,023	£84,100
	Cwt.	Cwt.
Gas and chemical machinery	21,994	27,813
Value	£252,315	£340,338
Scientific instruments: Optical		
Value	£73,338	£43,301
Thermometers, mercury, in glass etc.		
Value	£40,098	£23,686
	Cwt.	Cwt.
Air and gas compressors and exhausters	14,928	8,572
Value	£314,040	£191,165
	Cwt.	Cwt.
Non-Ferrous Metals:		
Aluminium and aluminium alloys	110,917	90,587
Value	£1,349,383	£1,042,608
	Lb.	Lb.
Bismuth metal (not including alloys)	37,710	14,866
Value	£24,536	£8,049
	Tons	Tons
Copper	4,797	9,157
Value	£1,051,795	£1,291,697
	Tons	Tons
Lead, unwrought, sheets, etc. ...	395	239
Value	£53,961	£30,061
	Cwt.	Cwt.
Nickel and manufactures thereof	14,422	20,993
Value	£332,859	£277,547
	Cwt.	Cwt.
Nickel alloys	7,645	8,308
Value	£179,172	£176,813
	Tons	Tons
Tin unwrought...	3,092	311
Value	£1,962,985	£178,609
	Lb.	Lb.
Tungsten (except ferro-tungsten)	17,977	15,901
Value	£13,340	£18,388
	Tons	Tons
Zinc	397	327
Value	£73,159	£35,522
Total value of group	£7,366,809	£4,539,070

FOOD PRESERVATION

Some Results of Recent Research

A GOOD example of the benefits which originate from fundamental research has been provided by its application to the basic properties of milk, producing as a result a big improvement in the keeping qualities of dried milk. The work was carried out at the Low Temperature Research Station of the DSIR, the Hannah Dairy Research Institute, and the National Institute for Research in Dairying. The story of this research will form part of the DSIR exhibit (Stand No. 76) at the British Food Fair at Olympia, London, August 29 to September 9).

The DSIR exhibit will demonstrate the two modern methods of preserving milk, by condensing and drying.

Milk Drying

Milk can be dried on hot rollers or by spraying in hot air after pre-condensation. The first method produces a satisfactory powder which keeps well but it has to be reconstituted with warm water. Hitherto it was the spray-dried, full-cream milk powder—which can be reconstituted easily in cold water—which had poor keeping qualities. As a result of the recent work this can now be kept in good condition for a year or more. Consequently, milk can be dried in the spring when it is plentiful and kept for use in the winter.

The commonest defect of the spray-dried powder, observes the DSIR in a review of this work, was a "tallowy" off-flavour due to the action on the fat in the milk of the air in the can in which the powder was packed. This can be overcome by replacing the air by an inert gas such as nitrogen. Another defect of this type of dried milk was the development of stale flavours, which was accompanied by some loss of its solubility.

Research work proved that this was due to a reaction between the protein and the sugar in the milk, the process being helped by too high a storage temperature and too much water in the milk powder. These disadvantages can be minimised by storing the milk at the lowest possible temperature, by drying as completely as possible at first and by ensuring that the milk powder cannot become damp during storage. Included in the DSIR exhibit will be a model of a gas-packing plant.

The gas storage of apples and other fruit will also be demonstrated on the DSIR stand. This method, although not new to growers, will probably be interesting to the general public, many of whom may not have been previously aware that by its use apples can be kept for nine months, which makes an English apple supply available all the year round. Models of a cold store and a gas store (using CO_2) will be on show, and advice on the construction and operation of the gas store will be available.

(continued at foot of next column)

NEW PHOSPHORUS WORKS

Its Erection Opposed

STRONG local opposition to the erection of a phosphorus factory at Portishead, near Bristol (THE CHEMICAL AGE, 63, 9), has resulted in a month's adjournment of the Portishead Planning Committee's consideration of the project, and a petition is being circulated in the town.

The main objections are that the storage silos would be unsightly, that the processes involved would be odoriferous. that there would be light emission from furnace tapping, and that the disposal of 40,000 tons of slag per year would create traffic problems for an already congested road system.

The final decision whether to oppose the scheme rests, however, with the Bristol Corporation; the local Council's attitude can only be one of influence. It has already been pointed out that officials and local representatives have visited a factory at Oldbury where no objectionable air pollution was observed from the processes similar to those which would be operated from the proposed factory at Portishead. It is considered unlikely that any hardship would be felt by residents from this cause.

The economic benefits of the factory to the locality, it is thought, would be considerable. The Rural District Council for the surrounding area has already decided not to oppose the factory.

Manchester OCCA

ISSUING to its members an advance syllabus of its meetings to be held in the 1950/51 session, commencing on September 22, the Manchester section of the Oil and Colour Chemists' Association announces the appointment of Mr. E. Sutton, of the Anchor Chemical Co., Ltd., as membership secretary. The essay competition is to be continued, but it is proposed to award the prizes every two years and to double the value of the prizes, donated by the British Oil & Cake Mills, Ltd., and J. A. Kemp & Co., Ltd.

SCIENTIFIC INSTRUMENT EXPORTS

Widening Possibilities in the Canadian Market

THE value of Britain's exports of scientific instruments of all kinds to the markets of the world now reaches a considerable sum. It is not possible to give a very near annual figure, because the Board of Trade export returns do not show details of items correctly coming under this heading. It is known, however, that Britain's total exports of scientific instruments in 1949, including surveying, nautical, engineering and a variety of measuring instruments, represented a value of approximately £10 million.

Many of the scientific instruments of interest to the chemist and the chemistry research worker are lumped together in the official figures. Among the few which are shown anything like separately, " thermometers, mercury in glass instruments and meteorological instruments of all kinds " produced a total export value last year of £426,020. Optical instruments were valued at £921,742; medical and surgical instruments reached a value of £581,378.

The Scientific Instrument Manufacturers' Association of Great Britain (SIMA), in its monthly bulletin for July, gives some useful details of this country's scientific instrument exports in February, March and April this year, which it has compiled with the collaboration of the Engineering Industries Division of the Ministry of Supply. Total values are: February £886,400; March £1,065,800; April £881,500. We reprint, with acknowledgment, the following breakdown (in £'000s) of these totals:—

	1950 February	March	April
Chemical, medical and surgical glassware ...	38.1	55.1	39 8
Other types of glassware, including rod	29.4	28.0	19.2
Photographic and cinematograph instruments and appliances	236.3	291.0	216.3
Optical instruments ...	67.6	71.2	68.1
Engineering and industrial instruments .. .	89.7	94.8	96.2
Nautical instruments and apparatus	36.5	41.4	26.8
Surveying instruments and apparatus	21.3	33.9	30.6
Thermometers, mercury-in-glass instruments and Meterological Instruments	36.0	42.7	34.6
All other types not elsewhere specified	162.3	209.8	171.2
Commercial instruments (electrical)	97.7	107.0	101.8
All other types of scientific electrical instruments ...	71.5	90.9	96.9

Compared with a monthly average of last year's figures, in such limited detail as is available, the totals given above for February, March and April this year indicate an upward trend. In fact, the situation as regards world prospects appears to be not without promise. A pointer is provided in the news letter of the SIMA president, Mr. J. E. C. Bailey, appearing in the association's current bulletin, in which he refers to the position of American-made scientific instruments as revealed to him on his recent visit to the annual convention in Chicago of the Scientific Apparatus Makers' Association of America.

U.S. Conditions

The outstanding feature of the American meetings, says Mr. Bailey, was undoubtedly the grave anxiety expressed by many members of the industry, particularly in the optical instrument sphere, over the competition being experienced in America from Japan and Germany. Naturally, he says, the possibility of further reductions in American tariffs—negotiations about which are due to take place in Torquay this September—gives causes for added anxiety to our American friends. It appeared that, in the case of binoculars, for example, American manufacture had been reduced to a very small figure. One manufacturer of optical glass had given up production altogether and others were considering following his example, purely on account of this intense Japanese and German competition.

Mr. Bailey says: " I was able to assure our American friends that it was not the policy of SIMA to seek a full-scale reduction of American tariffs, because we realised only too well that this would, in the main, give still further benefits to Germany and Japan, and that any reductions we might apply for would concern special instruments that were selling in the States now and would not cause any anxiety to the instrument industry in the U.S.A."

The SIMA president closes his news letter with an expression of opinion that the full-scale trend towards science is being maintained throughout the world generally, and that great opportunities are open to Britain's scientific instrument manufacturing industry in many countries overseas.

Referring to his visit to the Toronto

Trade Fair, Mr. Bailey says the display of British scientific instruments there was most impressive and reflected great credit on all concerned.

"We in the scientific instrument industry did not go to Canada under any misapprehension. For example, we realised that there was no large pent-up demand for instruments waiting to be filled. On the other hand, we wanted to give Canadian users an opportunity of seeing British scientific instruments and also to establish whether or not there was indeed a market for our products there. By common consent both points were fulfilled; Canadian scientists and users of instruments came in large numbers and expressed their deep satisfaction with the design and craftsmanship of the instruments. Prices were undoubtedly attractive, while it was established beyond all doubt that there was not only a market in Canada but an expanding market."

Prospects for British scientific instruments in the Canadian market are referred to in optimistic terms by Mr. A. G. Peacock, editor of the SIMA bulletin. He says: "Generally speaking the Canadian instrument buyer is most favourably disposed towards British equipment. He is not, however, affected by sentiment, knows what he wants in his equipment, and demands the right price. From even the briefest survey the possibilities of the Canadian market appear limitless. The full resources of the country have as yet been hardly touched and the exploitation of much of its wealth of minerals has not even started. The oil fields are expanding rapidly and much equipment of all kinds will be needed. In Nova Scotia iron ore reserves are only now beginning to be developed. Engineering and process industries of all types are expanding and sub-assembly or part manufacture are being replaced by primary design and production in Canada."

An idea of the present distribution of scientific instrument imports into Canada is given in the bulletin. (In making a comparison of Canada's share in Britain's world exports of any particular group of scientific instruments, the value of the Canadian $ may be taken as 6s. 4d.). For example, in 1949 $723,275 worth of thermometers were imported into Canada. Britain's share was $48,895; the remainder, $674,880, was from the U.S.A. X-ray apparatus totalled $2,772,452; Britain's share of this was $8073, the U.S.A. heading the figures with $2,743,800. Optical instruments totalled $3,127,143; of this, Britain exported $177,643, France exported $163,082, and the U.S.A. again claimed the bulk with $2,668,465. In the case of X-ray apparatus, five other countries contributed to the imports into Canada with about $4000 worth each. The optical instrument total was contributed to by 10 other countries besides Britain and the U.S.A. The figures for Germany and Japan were $51,269 and $42,976 respectively.

UNESCO Scheme for Scientific Education

SCIENTIFIC instruments, apparatus and collections intended for education or research will enjoy duty-free entry under a new international agreement sponsored by UNESCO to reduce barriers to world trade in educational, scientific and cultural materials. The text of the convention was recently approved by the 59 member states at the general conference of the organisation in Florence.

Exemption of duty will be dependent on the scientific instruments and apparatus being intended solely for educational or research purposes and destined for recognised educational or scientific institutions. Another provision is that materials of equal scientific value are not already being manufactured in the importing country.

UNESCO is circulating the convention to all its member states and to members of the United Nations. It will be open for signature shortly at Lake Success, New York, and will come into force following ratification by 10 countries. The United Kingdom Government has announced that it will submit the text to Parliament for ratification. Belgium, France, Luxembourg, the Netherlands and Switzerland are expected to take action for quick legislative approval.

The agreement on the importation of educational, scientific and cultural materials will also permit the free import of books, newspapers, periodicals, maps and charts. To aid their circulation further, contracting governments will grant licences and foreign exchange for publications consigned to public libraries.

Duties will also be lifted from educational, scientific or cultural films, filmstrips, newsreels and sound recordings.

This is the second international agreement sponsored by UNESCO. The first, designed to abolish duties, quotas, and licences hindering the movement of film recordings and other audio-visual aids to education, has now been signed by 18 countries.

INDUSTRIAL FINISHES

Modern Developments on View

THE importance of industrial finishes and their applications in a wide range of products will be demonstrated publicly for the first time at the Industrial Finishes Exhibition which will be opened by Sir Charles Goodeve, director of the Iron and Steel Research Association, at Earls Court, London, next Wednesday (August 30).

In the central technical exhibit the suitability of finishes for different purposes will be demonstrated. There are seven sections which show natural metal finishes, plated finishes, hot dipped coatings, sprayed metal finishes, vitreous enamel, organic finishes (lacquers and paints), and the anodising and dyeing of aluminium.

An entire demonstration unit more than 30 ft. long has been transferred to Earls Court by F. J. Ball & Co., Ltd., from its factory in Staffordshire. The unit will be complete with water-wash spray booth and compressor system and spray guns.

How infra-red gas-fired panels cut down time and cost in the drying processes of all finishes will be demonstrated by De La Rue & Co., Ltd. The panels will be grouped in a conveyorised tunnel and demonstrators will show how articles of all shapes and sizes can be dried on a simple line conveyor at the rate of 9,000 per hour.

Petroleum Chemicals

The important rôle now being played by the chemicals-from-petroleum industry in the production of surface finishes will be shown by Shell Chemicals, Ltd. Emphasis is, of course, given to products of particular interest to the surface coating industry, such as acetone, methyl ethyl ketone, methyl isobutyl ketone, diacetone alcohol and secondary butyl alcohol. Teepol is also shown to have its place in finishing by virtue of its use in pigment grinding, stabilising distempers, degreasing prior to coating, plating and acid pickling.

A new enamel treatment is being shown for the first time by the Lewis Berger group. Known as Polykem 666, this is an air-drying styrenated enamel used as a finishing treatment for hardware, sheet metal products, tools, etc.

Other exhibitors include: Bakelite, Ltd.; British Iron and Steel Federation; British Colour Council; British Standards Institution; Council of Industrial Design; Electrodepositors' Technical Society; Jenolite, Ltd.; Jenson and Nicholson, Ltd.; Metachemical Processes, Ltd.; the Board of Trade; Vitreous Enamellers' Association.

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CHEMISTS AND THE PRESS

Aiding the Non-Scientific Reader

HOW the achievements of chemists and their services to the community can best be made known and explained to industry and the public has for some time been a matter of careful consideration by the Chemical Council.

A panel of chemists who are qualified both as writers and chemists and are willing to write an occasional article for the Press has been set up by the council in collaboration with the Royal Institute of Chemistry, which has agreed to act as centre of contact between the Press and the experts.

A Specialist Panel

Those who have given their names for inclusion on the panel are all highly qualified in chemistry and specialists in their own particular line. An ability to write for the non-scientific reader as well as their status as scientists has been considered an essential qualification.

The list of writers has been classified into six groups: the science of chemistry; chemistry in agriculture; chemistry in relation to foods and nutrition; chemistry in relation to medicine; chemistry and law; chemistry in industry.

The Chemical Council particularly wish that neither members of the panel nor the RIC should be asked to give information by telephone on current subjects. This method of information on scientific matters is considered liable to error or misinterpretation, and might prove detrimental to the development of closer relations between scientists and the public.

Articles prepared for the Press by scientific men should be treated in such a manner that the meaning and balance are not destroyed. Wherever possible it would be appreciated if a proof of the article could be submitted to the contributor.

The council emphasises that the panel has been drawn up mainly at the suggestion of and for the convenience of the Press. The list of members of the panel does not claim to include all those qualified to write for the Press neither does it restrict in any way the freedom of editors to invite contributions from chemists, nor authors to submit articles to the Press.

Articles contributed by members of the panel would be paid for at rates in conformity with those paid to members of other professions.

CHEMICAL PLANT IN GLASS

Wide Scope in Laboratory and Factory

AN outline of the properties of glass and its scope as a constructional material for chemical plant, from pilot scale to full production, was given by Mr. B. H. Turpin, director and manager of Quickfit & Quartz, Ltd., London and Stone (Staffs.), in an address to the 7th Scandinavian Chemists' Congress at Helsinki this week (THE CHEMICAL AGE, 63, 209).

Although a relatively new material in the field of plant construction, the main advantages of glass—its resistance to corrosion, visibility of contents and absence of contamination of the product—were well established in the course of years of laboratory experience. The knowledge of glass itself and of the methods of production were perhaps less familiar than those of the metals employed in chemical plant. This might be due, not only to its more recent appearance in this field, but also in some measure to the comparative scarcity of technical literature on the subject.

Thermal Expansion

After giving a history of glass manufacture and the stages of progress in the methods, from the earliest records some 11,000 years ago to the present day, embracing flint glasses and heat-resisting glasses, Mr. Turpin quoted the constituent parts of the various common and modern types and gave their respective linear coefficients of thermal expansion.

It was generally true to state that the one essential feature of a glass to be used by the chemical engineer was that of good resistance to thermal shock. The risk of accidental mechanical breakage on the plant could be tolerated, since such failure could be explained and precautions taken to prevent its recurrence. Fracture of glass units during raising and lowering of temperature, without apparent explanation, could not, however, be tolerated, since the duration of a particular plant would be unpredictable.

The property of resistance to thermal shock was controlled by the linear thermal expansion coefficient. Most glasses were poor conductors of heat, so that when glass was heated or cooled internal stresses were set up which were only slowly relieved. The lower the thermal expansion, therefore, the greater the thermal endurance and *vice versa.*

Pure silica, the basic constituent of glass, had a low coefficient of expansion and glasses with a high silica content generally possessed lower thermal expansion coefficients than those of low silica content. The low expansion or heat-resisting borosilicate glasses generally provided the material for the construction of chemical plant.

A property of glass of interest to the chemical engineer was its thermal conductivity. This in itself was extremely low, 300 times less than that of copper, and should at face value at once preclude the consideration of glass for heat exchanger work. It was well known, however, that heat exchanger efficiency was controlled by surface film conditions rather than by thermal conductivity. Metal surfaces, never as smooth as those of glass, held a considerable film of liquid or gas adjacent to the surface. These films were more readily swept away from glass surfaces, which also inhibited the tendency to scale formation.

Although the thermal conductivity of copper was so greatly higher than that of glass, new copper heat exchangers had, in fact, given results of only two to three times the efficiency of glass units, with a continued falling off in performance as the copper corroded.

Fireproof Qualities

One practical example of the resistance of glass to thermal shock concerned the use of a 15 sq. ft. condenser situated at the top of a still. While distilling acetic acid the still caught fire at the base. Flames passed both around the outside and through the centre in contact with the cooling coil still circulating cold water, until the rubber feed tubes were burnt away from the water connections. After the flames were extinguished the glass condenser was found to be intact and was put into service again.

The modern tendency in chemical plant design seemed to be towards the use of smaller, more efficient and flexible units, rather than towards very large single purpose units. This feature was, of course, very favourable for glass, since the size of vessels was obviously limited.

A quick survey of the applications of glass in commercial chemical production would indicate the following:—

Glass pipelines are used in chemical manufacture, conveying corrosive fluids,

strong acids, both gaseous and liquid, and in food manufacture for conveying fruit juices, sauces, vinegar, milk and alcoholic and other beverages.

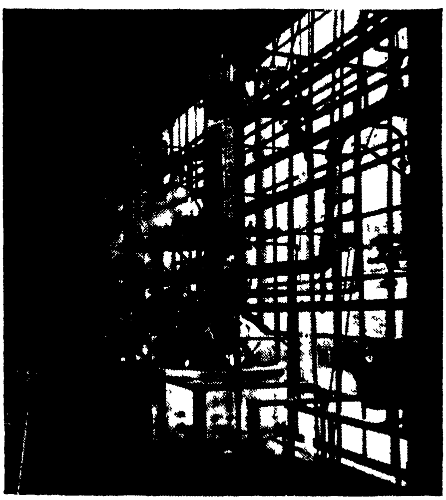
Glass condensers are used for the distillation and reflux of corrosive chemicals, acids, drugs, solvents and pyrogen-free water; the recovery of solvents often containing dissolved acids; and the recovery of alcohol from fermentation vats, etc.

Glass boilers and heat exchangers are used for the pre-heating of corrosive liquors, feeding to stills or vats as evaporators on continuous stills, and for heating liquids for large batch stills they are used as flash evaporators for purposes including the sterilisation and concentration of fruit juices.

Glass stills of batch or continuous types are used in the production of corrosive chemicals, fine chemicals, drugs, essences, flavourings and the recovery of solvents.

Glass extractors and absorption towers are use for liquid/liquid or liquid/solid extraction for gas liquid scrubbing and for gas absorption.

The field of hydrochloric acid absorption could be well covered by glass plant from small-scale to the largest plant available. In the present need for strict economy, hydrochloric acid, which might be a by-product from chlorination processes, could be recovered in the form of strong solution, using suitably designed absorbers, incorporating ring packed column sections to go with heat exchanger units, also used as packed columns. These heat exchanger units extracted the heat of solution of acid



Two Quickfit glass stoves operating as productive units

in water within the column itself, thus enabling strong acid to be recovered direct. Hydrochloric acid, which used to be a waste product, was now being recovered economically at a strength suitable for use in other processes.

A development in the manufacture of sulphuric acid which had shown considerable savings in cost in the production of analytical quality acid, was the use of glass towers for the absorption of sulphur trioxide from the vanadium catalyst plant to produce pure acid in one process. 98 per cent sulphuric acid was circulated through a glass absorption tower using an air-lift pump, distilled water added for make-up, and filtered SO_3 admitted to the base of the tower. Plant dealing with some 10 tons per day had been constructed in this way.

Large Vessels

In chemical plant which called for large vessels, vitreous enamelled metal vessels were, in many cases, used in conjunction with glass fractionating columns, condensers, and other ancillary gear, and considerable savings in cost were effected by the durability of the glass and the fact that the processes being carried on inside the plant were visible. The correct loading of a fractionating column could be maintained purely by the visual inspection of the operator. If the operation was one of chlorination, maximum input of chlorine could be effected without loss, since any un-reacted chlorine was noticeable in the glass condenser.

An industry which gained much from the properties of glass and had full-scale production within the capacity of glass plant, was the drug and fine chemical industry. Many materials were now in commercial production in glass plant which where not a commercial proposition from any other material, and glass plant had become a necessity for the production of expensive and rare drugs, including those used for intravenous injection.

Glass pipeline was simple to instal since all parts were fabricated in the works to close limits. As a general principle, glass equipment was suspended rather than clamped. Horizontal pipelines were supported on adjustable hanging brackets protected by rubber or asbestos wrapping.

Large heavy-plant units, such as columns, condensers, etc., were suspended either by rods through the flange bolt holes or by counter-balance methods. The 12-in. backing flange was provided with three hemispherical recesses so that counter-balance or adjustable screws might be used.

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DSIR Research on Refuse Disposal

EXPERIMENTS to help solve the problem of the disposal of refuse, and which incidentally will reclaim derelict land for useful purposes, are at present in progress. They are being carried out by the Chemical Research Laboratory, DSIR, in collaboration with local authorities.

The disposal of refuse is an important and awkward problem. The disadvantage of the tipping method employed indiscriminately is that it may easily cause a serious nuisance. The nuisance is caused by the growth of living organisms known as sulphate reducing bacteria. These bacteria transform sulphates in contaminated waters to hydrogen sulphide with its offensive smell.

Sulphate reducing bacteria exist in almost all soils and waters but do not begin to grow until suitable organic matter is fed to them. When rubbish containing putrescent material is tipped into a wet pit the sulphate reducers may grow very rapidly and produce large quantities of this foul smelling gas. Cases have been reported to the Chemical Research Laboratory in which the paint of nearby houses has been blackened both inside and out and it has been impossible to keep silver and copper utensils clean and bright.

The experiments now in progress are being carried out by the CRL in collaboration with the Twickenham Borough Council. A new refuse disposal works is being built in the centre of a ring of wet gravel pits, and it would be obviously desirable if the clinker from the incinerators and the fine refuse which is not incinerated could be tipped into them.

Both the materials have been tested in the laboratory. The clinker produced no sulphuretted hydrogen, even after long incubation in water, but with the fine refuse it began to evolve after only 24 hours. The borough engineer in charge of the scheme has suggested dividing one of the pits, containing about 120 million gal. of water, into lagoons holding about 1 mil. gal., the walls of the lagoons being made of the inert clinker. The idea is that the fine putrescent refuse should be tipped so quickly into the comparatively small lagoons that they should be completely filled before any nuisance develops. If any sulphuretted hydrogen should occur it could easily be stopped by adding sufficient acid to prevent further growth of the bacteria.

An experimental lagoon has been built to test the method on a practical scale. Tipping of the fine refuse has begun and early results are encouraging.

CHEMICAL PLANT IN GLASS

(*continued from previous page*)

It was often necessary to connect glass pipes to metal pipes, vitreous enamelled vessels and valves. For that purpose metal backing flanges drilled to suit standard metal pipe flanges were provided.

Glass chemical plant was manufactured to withstand the following conditions in service:—

Normal maximum working pressure of pipelines up to 3-in. diameter, 100 psi; 4-in. diameter, 60 psi; 6-in. diameter, 50 psi; 9-in. diameter, 20 psi; 12-in. diameter, 10 psi; higher pressures can be worked at for special requirements by arrangement with the manufacturer.

The maximum working temperature can be considered as 300° C. For temperatures above 150° C., however, precautions should be taken to prevent excessive thermal shock such as chilling with rain or snow.

Pipeline will withstand all normal pump and machinery vibrations. When connecting glass pipes to vibrating machinery rigid support should not be made within 10 ft. of the vibrating equipment. Precaution should be taken to avoid "water hammer."

Glass is suitable for use with all acids with the exceptions of hydrofluoric and hot concentrated phosphoric acids. Glass may be used successfully with dilute alkalis, but is attacked by hot strong caustic solutions.

It had, in England, become increasingly apparent that the application of glass plant had practically no limit, and many unexpected industries found it had good applications. Particular applications which had recently been given publicity in English technical journals and at exhibitions were the manufacture of the drug chloromycetin, the radioactive carbon isotope C^{14}, and pyrogen-free distilled water.

Finally, Mr. Turpin stressed the outstanding advantages of glass in industrial plant, by reason of its resistance to corrosion and its resultant maintenance costs; its purity and cleanliness; its visibility, particularly as an aid to plant control.

SILVER AND PLATINUM CATALYSTS

Some Recent Applications in German Industry

BOTH silver and metals of the platinum group have been used as oxidation and reduction catalysts for many years. The use of platinum in preparing sulphur trioxide was patented by Peregrine Philips in 1831, and the manufacture of sulphuric acid by this means became a commercial process about 1878. Not until early in the present century, however, did the chemical industry become a major consumer of noble metals for use as catalysts.

For several years the large industrial application of precious metal catalysts was confined to contact process sulphuric acid plants. The development of efficient base metal catalysts has to some extent lessened the importance of platinum in the sulphuric acid industry, but other industrial processes have since come into use requiring platinum, rhodium, palladium and silver in considerable quantities.

To-day, the largest use for platinum catalysts is for ammonia oxidation, which is now the source of almost the entire world output of nitric acid. The first technical plant for the production of nitric acid by the aerial oxidation of ammonia over a platinum catalyst was erected in Germany during 1909.

This plant was based on Ostwald's specification of 1902, and had a number of small chambers arranged to provide heat exchange between incoming and outgoing gases fitted with catalyst pads formed of pure platinum foil. Nowadays, the system most generally adopted involves the use of superposed gauze nets introduced by Kaiser (B.P. 24035/1911), but the process remains fundamentally that which Ostwald devised.

Notable Improvement

The most important modification has been the introduction by the Du Pont Company of oxidation at elevated pressure, usually 6 to 7 atmospheres, which increases the speed and efficiency of converting the oxides of nitrogen to nitric acid. The advantages gained are a reduction in the size of equipment required and a high final acid strength.

At these pressures, however, it is difficult to obtain high efficiency in the oxidation of ammonia or oxides of nitrogen. Higher temperatures must therefore be used for pressure oxidation, to obtain good conversion efficiency, and this results in a more rapid deterioration of the catalyst. Because the reaction temperature is greater than 600°C., it is evident that only the platinum group of metals is capable of withstanding the conditions while remaining in metallic form.

The need for longer catalyst life at very high temperatures led to the introduction of rhodium-platinum alloys containing up to 10 per cent of rhodium, which have a much lower loss rate at high temperatures than that of pure platinum.

Loss of Metal

The economic value of a catalyst depends upon loss of metal conversion efficiency and capacity. An alloy with extremely high conversion efficiency may be entirely uneconomical in use because of the resulting high loss of metal. Pure platinum-rhodium alloys are more economical and useful for oxidation at elevated temperature than any other catalysts. With few exceptions, the efficiency of base metal catalysts is too low for economic use despite their relatively low cost.

One disadvantage of platinum group metals for this application is that even minute traces of certain materials can poison the catalyst. Great care has to be taken to eliminate them completely. Modern developments in metal-refining have overcome many of the difficulties formerly encountered. To-day, most high pressure plants use gauze woven from 10 per cent rhodium-platinum wire arranged in multi-layer catalyst pads of 20 to 30 individual nets. This enables a very large quantity of ammonia—for example—to be oxidised in a relatively small converter. Close chemical and metallurgical control of the wire properties is essential. Great care and skill are required to weave these very soft, fine wires into blemish-free gauze, which, in rhodium-platinum for ammonia oxidation, is woven in widths up to 9 or 10 ft. continuously.

Pure platinum is an effective catalyst over a wider range of conditions than the rhodium-platinum alloys. It is usually preferred, therefore, for nitration process sulphuric acid plants. Most of these plants are supplied with nitrogen oxides by a small oxidation unit, generally of the United Alkali pattern with a built-in heat exchanger, and fitted with a pad of four rectangular gauzes mounted vertically.

The process requires a flexible supply of the oxides and, whereas the ammonia

burners of a nitric acid plant generally operate under almost constant load, these small units are worked at capacities ranging from less than 50 per cent to more than 200 per cent of normal. A special gauze, woven from wire of diameter 0.0026 in., is used in these small units since the lighter material is more satisfactory.

Platinum is also used extensively as a hydrogenation catalyst in organic synthesis. For this purpose it is dispersed on the surface of carriers such as pumice or charcoal, or may be used directly in the form of platinum black without a support.

German Process

Of all the metals, palladium has the greatest affinity for hydrogen and is a very active hydrogenation catalyst. The direct hydrogenation of acetylene to ethylene with hydrogen, using a palladium catalyst, was carried out on a large scale in Germany during the war. One interesting plant is described in BIOS final report No. 1411. It had a capacity of 3000 tons of ethylene per month and the product was used during the war for the production of glycol and mustard gas.

The process consisted of passing acetylene and an excess of hydrogen and steam over a catalyst of palladium in silica gel at about 270° C. and under ordinary pressure. The gas produced was collected in a gasometer and separated in a Linde plant. The recovered hydrogen was returned to process.

The consumption of catalyst amounted to 1 kg. of palladium per 1600-1800 tons of ethylene produced. Because the palladium catalyst was present in great dispersion in the silica gel purity of the raw materials—particularly of the acetylene—was of great importance for long catalyst life.

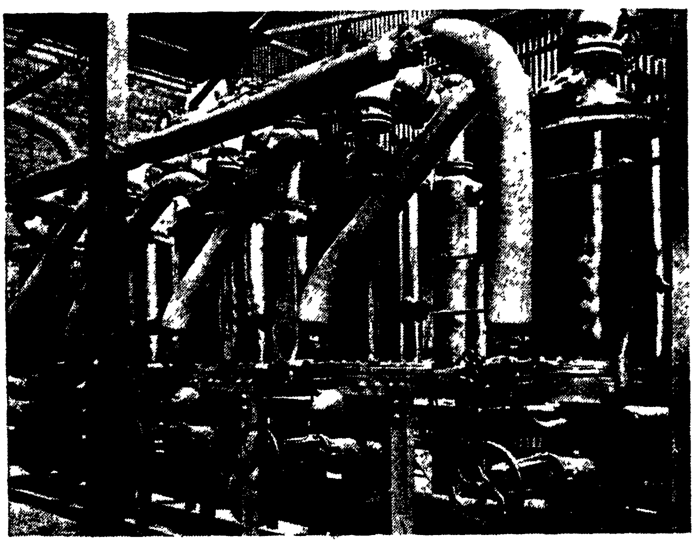
The spent catalyst contained from 30 to 40 per cent of organic matter, mainly cuprene and tarry materials, which were removed by treatment with superheated steam and air. After this the catalyst was taken from the furnace and screened. The regenerated catalyst was either stored or returned to the hydrogenators in the same way as fresh catalyst. Loss during the regeneration process amounted to about 10 per cent of the catalyst.

Palladium also finds limited use as a catalyst for the purification of oxygen and hydrogen and for the removal of residual oxygen from atmospheres required for bright annealing and other operations where complete freedom from oxygen is necessary.

Methyl Alcohol

Silver has almost universally replaced copper in the catalytic vapour-phase dehydrogenation of methyl and ethyl alcohols. The great volume of formaldehyde solution consumed industrially is almost all manufactured by the dehydrogenation of methyl alcohol. The process requires the passage of a stream of water vapour, air and an excess of alcohol vapour through a catalyst bed, maintained at about 600°C. by the heat of reaction.

After condensation, the products are fractionated and the small proportion of unconverted alcohol is recycled. In a few



Furnaces for the production of acetaldehyde from ethyl alcohol. Each furnace is provided with a catalyst bed of pure silver gauze

instances the silver catalyst is dispersed on a carrier, pure recrystallised silver nitrate being employed. In most existing installations, however, the catalyst is either a thick pad of many layers of silver gauze or a shallow bed of crystalline silver. The crystalline catalyst is prepared by electrodeposition under conditions regulated to produce hard crystals. These are screened into close size ranges.

The similar reaction of ethanol vapour with air is also used industrially on a considerable scale. The acetaldehyde thus produced is mainly consumed as an intermediate in the manufacture of crotonaldehyde, n-butyl alcohol and acetic acid. Certain higher aldehydes are similarly manufactured, and there are a number of other oxidation reactions for which silver is a useful catalyst.

Two notable examples of the catalytic use of silver in formaldehyde production are afforded by the I. G. Farbenindustrie plants at Ludwigshafen and Leverkusan (BIOS final report No. 1331).

The process is based on the oxidation and dehydrogenation of methanol with a granular silver catalyst at a high temperature. Air is saturated with a mixture of methyl alcohol and water in the ratio of 3 : 2 and is passed over the catalyst maintained at 640-660°C. The product is cooled and condensed and the gases are scrubbed. Formaldehyde is collected and brought to a standard strength of 30 per cent weight.

Electrolysis

The silver catalyst is produced by the electrolysis of a solution of silver nitrate containing 3 per cent $AgNo_3$ and 0.1 per cent HNO_3. The solution is warmed to about 45°C. The electrolyser consists of four platinum strip anodes and a large silver cathode. Metallic silver in linen bags is placed about the anodes, where it is dissolved. It is deposited on the silver cathode, and is stripped off by a continuous mechanical scraper. To maintain a uniform concentration, the solution is kept agitated during electrolysis by passing air through a perforated glass tube lying on the bottom of the cell.

The accumulated deposit of granular silver is removed from the cell at about 20 hour periods. The adhering nitrate solution is resorbed and returned to the cell bath, which is kept at a constant level. The silver is then thoroughly washed with distilled water, dried and heated at a dull red heat for one hour in an electrical oven.

Exhausted catalyst is regenerated by heating at a dull red heat for one hour in a current of air, followed by a few minutes

[Both photographs by courtesy of Johnson, Matthey & Co, Ltd

Activated crystalline silver catalyst material used for the production of aldehydes by the vapour-phase dehydrogenation of ethyl and methyl alcohols

heating in a current of oxygen. The silver is then treated with pure concentrated hydrochloric acid and allowed to stand overnight to remove any iron or copper. The acid is drained off and the silver is washed with distilled water until all traces of chlorine have been eliminated. Finally, the silver is allowed to stand for 12 hours in a weak solution of ammonia. It is then drained, again washed with distilled water, dried and heated for one hour at a dull red heat in a current of air.

One of the most interesting reactions for which silver is a useful catalyst is the aerial oxidation of ethylene as a route to ethylene glycol, which avoids the chlorhydrin stage. A plant was erected by I. G. Farbenindustrie at Zweckel to produce 100 tons of ethylene oxide monthly, by the direct oxidation of ethylene with air and/or oxygen. Though economically competitive with the more usual chlorhydrination method the plant was never completed. It is described in FIAT 875 and involves the use of both silver and palladium catalysts.

Oxidation Chambers

The silver catalyst to have been used was a pure silver-on-pumice composition manufactured in the oxidation plant. It was prepared by impregnating pumice with silver oxide and subsequently reducing this product in a silver-lined reactor, using a nitrogen-hydrogen mixture at 200°C. There were altogether four multi-tubular oxidation chambers, containing about 12,000 tubes and charged with a catalyst mass embodying 120,000 oz. of silver.

Properly handled, this catalyst was expected to have a life of one year, based on laboratory and pre-pilot plant experi-

(continued at foot of page 295)

ZIRCONIUM SILICATE

Some Recent Commercial Applications

ZIRCONIUM silicate, or zircon, $ZrO_2.SiO_2$, occurs in most types of igneous rocks but it is produced chiefly as a fine-grained material from detrital sediments formed by weathering of the parent rock, accompanied by gradual concentration of the heavier elements. The main sources of supply are Australia, where its recovery has been developed extensively on the New South Wales coast and also on the Queensland border; in India, where the chief centre of production is Travancore State; and the U.S.A.

Zircon is not only a good refractory material, it possesses other properties of value to industry. It is a good electrical insulator, even at high temperatures, and imparts good heat shock resistance to components made from it. Zircon is practically insoluble in most mineral and organic acids, and is unaffected by aqueous alkalis. It is, however, decomposed by alkaline fusions.

Ceramics and Abrasives

These properties make zirconium silicate valuable in the ceramics, super-refractories and abrasives industries and for the manufacture of dental and high-temperature casting cements, and for the construction of foundry cores and moulds. The melting point of zirconium silicate varies between 2200° and 2300°C., depending on purity, and it has a specific gravity of 4.65; its coefficient of expansion is very low.

One of the most recent and rapidly expanding fields in which zircon is proving useful is in foundry practice for grey iron, steel, some types of bronze, and light alloy castings. The thermal conductivity of zircon sand is much higher than that of silica sand hitherto used in foundries, and this is a big advantage in the construction of moulds and cores, because the more rapid chilling provided by zircon sand produces superior castings. Zircon promotes better feeding in heavy metallic sections, with less tendency toward hot-tearing.

Because of the very fine grain size of zircon sand, the permeability rating is much lower than that of other sands. Zircon sand cores need not, however, be vented more than cores made of ordinary silica sand.

Zirconium silicate sand has spherical particles, and the grains make contact with each other at only a small portion of their surface area, so leaving definite interstices between the particles. Because of this the passage of gases through the sand is more readily achieved than with sands composed of irregular angular grains of the same size. This makes possible the use of a finer mesh round-grain sand without losing of good permeability.

Zircon sand is also used as a lining for induction melting furnaces, and as a seal for metal heat-treating furnaces. Its high hardness and low free silica content make it effective in cleaning non-ferrous castings where high - silica sands are objectionable, due to infectious silicosis. Here, its property of closing up minor surface imperfections by peening action is also useful.

Both cores or moulds may be made entirely of zircon sand, but for economy—when they are relatively large—they may be faced to a depth of ½ in., the main body of the core or mould consisting of other material. To give the same strength, much less core oil is required in zircon sand cores than in silica sand cores.

The use of a small proportion of cereal binder gives cores of greater green strength which are more easily handled. A typical mix would be: 85 parts zircon sand, 1 core oil, 0.2 starch, and 1 part water.

Use as a Chilling Medium

In the construction of cores and moulds for magnesium castings, zircon sand is supplanting silica sand and metal shot as a chilling medium, because zircon sand extracts heat more rapidly from certain critical areas in the castings, on account of its high thermal conductivity.

Zircon flour is merely zircon sand finely milled to a particle size of about 325 mesh, as compared with that of the sand which ranges between 80 and 200 mesh. The flour is applied to the surface of a core or mould as a wash, and a small proportion of Bentonite or other colloidal clay is added, together with core oil or a cereal binder.

Synthetic zirconium silicate is produced by high temperature chemical reaction between the two oxides, zirconia and silica, made possible by the use of ethyl silicate as a bonding liquid. The process

depends on the very reactive nature of the silicate deposited during the hydrolysis of the ethyl silicate. Using 10 per cent silica and 90 per cent zirconia, a product is obtained having a melting point of about 2600°C.

In the commercial production of synthetic zircon, use is made of silesters, which are liquids containing 40 per cent by weight of silica. They may be considered as convenient alternatives to fluxes and clays, for they yield silica in a reactive and adhesive form. The silester bonding process makes possible the synthesis of a whole series of silicates such as mullite, $3Al_2O_3.2SiO_2$ and forsterite, $2MgO_2.SiO_2$; in addition to zircon, from high quality sillimanite or alumina, magnesia and zirconia.

Because clays and fluxes are eliminated, these manufactured products have better qualities. The ease with which awkward shapes are produced in fine detail by the use of simple types of moulds, and with physical properties varied to meet specific needs, is another advantage of this technique. One type of synthetic zircon has a comprehensive strength of over 20,000 lb. p.s.i. and a Moh scale hardness of 7.5.

Some typical applications of synthetic zircon include interiors for gas-, electric-, or oil-fired furnaces; liners and formers for electric muffle furnaces; insulators, sleeves and inserts for low-frequency coils; burner blocks and element-retaining bricks; tubes for high-temperature furnaces working in inert atmospheres; crucibles; saggers for furnace or kiln apertures. The product is also being used for work in connection with jet aeroplane design and atomic energy research. Zircon refractories are used fairly widely in the manufacture of phosphates, in aluminium refining, and in the production of precious metals, etc.

Zirconium silicate electrical cements are now applied to the electrical insulation of heater units. In this capacity they exhibit very low operating and humidification leakages and extremely fast returns to normal after humidification tests are completed.

A typical cement of this character applied to the insulation of laundry irons shows an operating leakage of only 0.002 mA., a standard humidification test leakage of 0.1 mA., and a return to normal in 15 to 30 seconds. Another grade of electrical cement, used for the insulation of electrical elements, shows an operating leakage of 0.02 mA., a humidification test leakage of 0.5 mA., and a return to normal within 10 to 15 seconds.

SILVER AND PLATINUM CATALYSTS

(*continued from page 293*)

ments. No satisfactory regenerative technique had been discovered. Apparently, a spent catalyst can only be treated to regenerate silver nitrate.

The ethylene at Zweckel is derived from coking operations. It contains about 0.5 per cent acetylene, which has to be removed because it is decomposed by the silver catalyst, with deposition of carbon and a rapid fall in activity. A palladium-on-silica hydrogenation catalyst developed by the acetylene group at Ludwigshafen was to have been used in the ethylene stream.

When pure acetylene is hydrogenated, the concurrent formation of ethane is only 5 per cent. In the present instance of dilute acetylene in ethylene, only a very small amount of ethane is formed, which neither reacts appreciably over the silver oxidation catalyst nor interferes with the process.

The palladium contact mass is prepared by dissolving palladium nitrate in distilled water with weak nitric acid, yielding a solution containing 11 per cent palladium. The stock solution is diluted to a concentration of two grams palladium per litre and used to impregnate 2-6 mm. dia. silica gel. The gel is heated to 100-150°C., sufficient solution being added to give a catalyst having a 0.03 to 0.05 per cent palladium content.

The life of this catalyst for pure acetylene hydrogenation is between six months and one year, so that in the application described a longer life might reasonably be expected. The catalyst can be reactivated by burning off the accumulated carbonaceous matter with air gas. Apparently, the high temperature involved does not sinter or otherwise harm the material.

Nowadays, platinum and silver, both for catalysts and process equipment, are produced at a purity of 99.99 per cent, the former by chemical refining and the latter by repeated electrolytic refining. The British firm of Johnson, Matthey & Co., Ltd., have been closely associated with catalyst users in devising forms of greater efficiency and in establishing the necessary large-scale manufacturing techniques. The development of more efficient materials and processes is constantly extending the applications of noble metals as industrial catalysts where in many cases the relatively high cost is more than offset by the greater efficiency and long service life.

MINIATURE MAGNETIC BAR STIRRERS

Details of Simple Construction

by JOHN T. STOCK, M.Sc., Ph.D., F.R.I.C., and M. A. FILL, F.R.I.C.

INTEREST in the design of small-scale stirring apparatus has been on an increasing scale for some years. Present developments include vacuum-operated devices both reciprocating[1,2] and rotary,[3,4] a simple electric pump for stirring by means of a stream of air bubbles[5] and, more recently, miniature magnetic stirrers.[4,6,7] Because of its general utility, the last type created considerable interest when first exhibited,* and there have since been a number of inquiries about it, so that a fuller account of the design and construction is called for.

Several versions have been constructed. Fig. 1 gives a general view of three of them. All work very well and are valuable for small-scale titration or for potentiometric and conductometric techniques. The general-purpose bench model (A) is 5 in. long by 3¾ in. wide by 3¼ in. high. The top or titration platform is of white Perspex 1/16 in. thick, and a ⅛ in. thick front panel of the same material carries the switch and speed controller. The connecting leads are detachable, an accumulator or other external battery being used only when long runs are required. For ordinary work, energy is drawn from an internal flashlamp battery, so that the unit is self-contained. A competent technician can make one of these stirrers in a day.

Details of construction are shown in Fig. 2. A wooden cross-member A carries an electrotor B (obtainable for about 10s. from most shops dealing in model-making materials), mounted with the spindle vertical. The motor is held down by a bent strip of tinplate, which also partially isolates the magnetic field of the motor from that of the magnet above it. In the early models, an Eclipse pocket horseshoe magnet C was cemented in a cork or wooden cradle D which was in turn attached to the motor spindle by sealing wax.

Later, through the courtesy of James Neill (Sheffield), Ltd., some very small but extremely powerful Type M.4776A magnets were provided in the form of short slotted cylinders with central holes. A magnet of this type is easily mounted directly upon the motor spindle, as shown at (a). The light weight and small height greatly contribute to the freedom from vibration and long motor life which is characteristic of the later stirrers.

When the mounting operation is completed, the assembly should spin freely and the poles of the magnet should describe a circle in a plane parallel to the Perspex top E. Small brass washers or other packing pieces FF permit the clearance between the magnet and the underside of the top to be adjusted; a suitable clearance is about 2 mm.

Mounted adjacent to on-off switch G is a variable resistor H, of maximum resistance 10 ohms or a little higher, which permits the speed of the motor to be adjusted to a few hundred revolutions per minute. Operation at such low speeds gives excellent stirring, minimises current consumption and enables long runs to be undertaken without overheating the motor.

When H is set for a very low speed there is sometimes failure to start, although the motor at once picks up if the speed control is momentarily turned in the "increase" direction.

Mr. G. Ingram[8] is responsible for the suggestion that a booster button J should be incorporated. When this is depressed, resistor H is short-circuited. On switching on, the motor then receives the full battery voltage and never fails to start. The booster button is then released, when the

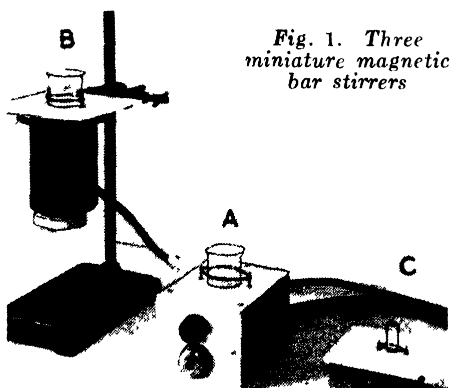


Fig. 1. Three miniature magnetic bar stirrers

*At the annual general meeting of the Microchemistry Group of The Society of Public Analysts and Other Analytical Chemists, in London, January 1950.

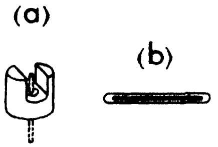
speed drops back to the predetermined level.

The contact strips of internal flashlamp battery I press upon small brass plates which are wired to the motor, resistor, etc.

Shown enlarged is the stirrer-bar (b), which is made from melting - point tubing. The core is either a portion of a needle or a few strands of fine iron wire and is slipped in before the second end of the tubing is closed in the blowpipe flame. For work in narrow vessels, the stirrer-bar may be less than 10 mm. long; in general, a length of from 10 to 20 mm. is suitable.

Having measured out the sample, a stirrer-bar is dropped into the vessel. On placing the latter centrally upon the titration platform and starting the motor, the stirrer-bar spins, following the motion of the magnet. For ordinary work, small beakers or conical flasks may be used, while the smaller vessels needed for working with limited volumes may be cut-down specimen tubes.

In this way, it was possible to perform successfully the conductometric titration of samples less than 1 ml. in volume. When the limited mouth area of the titration vessel is further reduced by the presence of electrode-assemblies, etc., the benefit of this method of stirring is fully realised. Particularly is this so when ingress of air or escape of vapour must be avoided, so that the titration vessel has to be hermetically sealed, as in the Karl Fischer method of moisture determination.



Motor spindle and stirrer bar (enlarged)

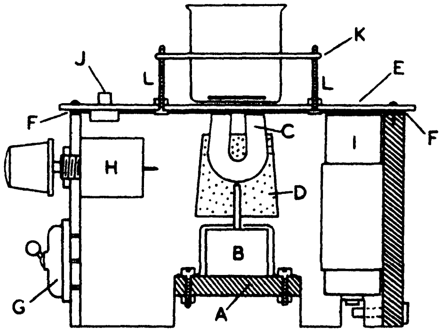


Fig. 2. Bench-type stirrer with internal battery

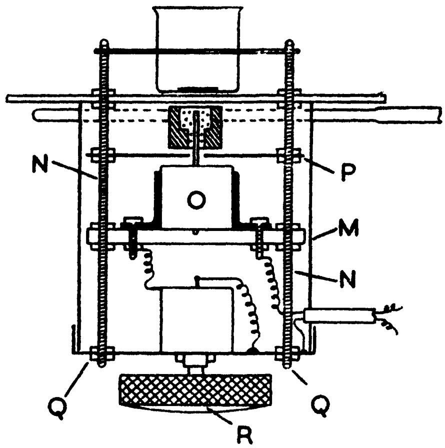


Fig. 3. Details of ring-mounting model

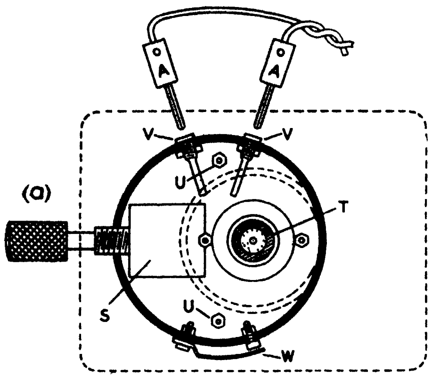
Besides being easily controllable, the stirring action is most powerful at the bottom of the liquid, so that splashing does not result even when the motion is rapid. Because of the vigorous agitation, the smaller titration vessels have a tendency to " wander " on the Perspex platform. This is prevented by rubber band K, stretched between pillars LL of No. 6 B.A. brass screw rod, which grips the titration vessel. The band may conveniently be made from a length of cycle valve tubing joined by a short piece of glass rod.

After having operated one of these stirrers for some 150 hours, including one non-stop run of 12 hours and several of eight hours the tiny bearings of the motor appear to be good for much more work.

To prevent loss of the stirrer-bar when emptying the titration vessel, a varnished or glass-enclosed bar magnet may be used to recover the stirrer. An alternative is to pour the contents of the vessel through a Buchner funnel (without filter paper).

A second version of the stirrer (B, Fig. 1) is designed for use on a retort stand. The cylindrical body slides freely into a retort ring of suitable size and the whole unit is firmly secured by four small Terry spring clips. These are screwed to the underside of the white Perspex platform and, when the latter is pressed cautiously and squarely downwards, snap over the thickness of the ring. Details of construction are shown in Fig. 3.

Body M is a slip-lid tin canister. The bottom, which is arranged upwards, is cut away, so that the magnetic field is not interfered with. The No. 4 B.A. brass screw rod pillars NN carrying the rubber



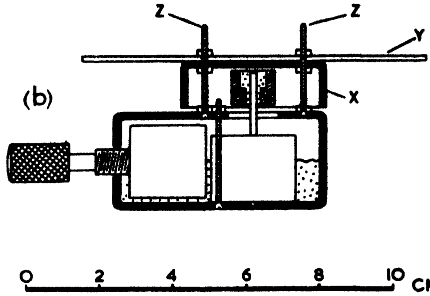


Fig. 4. Left, plan view, and right, side view of a low-built stirrer constructed of bottle caps

securing band pass right through the body of the apparatus. They thus support the motor assembly O, the tinplate screen P above it, and, with the aid of external nuts QQ, they retain the bottom cover. The latter is the lid of the canister and carries controlling resistor R.

By releasing the two nuts QQ, the bottom cover and body may be slipped downwards, leaving the motor assembly exposed for inspection and adjustments. The on-off switch, of the miniature pear type, is incorporated in the connecting leads.

Bottle-Cap Construction

At C (Fig. 1) is shown a third, low-built, version of the stirrer. The body consists of a pair of 2¼-in.-diameter flat black bakelite caps, as used on reagent bottles, placed mouth-to-mouth. A plan view with the top half of the body removed is shown at (a) in Fig. 4. Controlling resistor S, which is of the miniature variety and about ¾ in. diameter, and motor assembly T are retained in position by partially imbedding in sealing wax. This is done by adding the wax in small lumps and working in with a heated narrow tool.

Three holes are previously drilled in the cap; one accommodates the slightly-projecting lower end of the motor spindle while the other two allow the passage of No. 6 B.A. brass bolts UU which hold down the upper half of the body. Sockets VV and booster switch W and the appropriate wiring complete this part of the assembly. The booster switch is merely a strip of resilient brass about ¼ in. wide which, when pressed, will make contact with the head of a small brass bolt. When this is done, the resistor is short-circuited and the motor receives the full input voltage.

A hole about ⅝ in. in diameter in the upper half of the body allows the magnet to project through, as shown at (b), Fig. 4. Surmounting the magnet is a third, smaller, bottle cap X, and the square white Perspex titration platform Y. These parts are retained by bolts ZZ, the nuts on which allow the clearance between the magnet and the underside of X to be adjusted. As in the previous version, the on-off switch is arranged in the connecting leads, which terminate in banana plugs AA (a) for insertion into the sockets.

Several stirrer units of this type, some having minor modifications such as the location of the booster switch, reduced size of platform, etc., have been made and have given very good service. It seems that the design could be adapted for quantity production at a reasonable cost.

A similar form of construction is used in the vacuum-operated version[4,7] shown in Fig. 5. The bakelite caps forming the body are held together by a band of transparent adhesive tape.

Magnet B is held by sealing wax on the upper end of spindle C, which is part of a darning needle. A short length of heavy-

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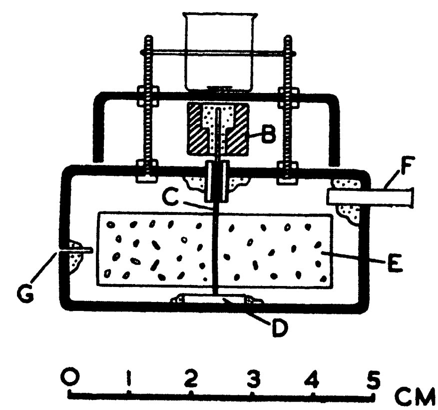

Fig. 5. Vacuum operated magnetic stirrer

Methyl Bromide Poisoning

Wider Knowledge of Hazards Urged

A RECENT fatal case of poisoning due to inhalation of methyl bromide is the subject of a report by Drs. A. C. MacDonald, J. C. Monro and G. I. Scott in the *British Medical Journal* (4676, 441). They are of the opinion that the dangers of exposure to this compound should be better known in view of its recent wide use in such things as fire extinguishers for ships and aircraft and in refrigeration plants. The case reviewed arose from the scrapping of fire extinguishers from aircraft engines, which involved emptying and cleaning them.

The method was to perforate the lower end of the copper bottle with a fireman's hatchet to let the vapour and fluid escape. Thereafter the brass top was sawn off the bottle. Normally, all this was done in the open air, but on the day in question the weather necessitated the cleaning of the empty bottles in a shed. In the course of his work, the victim had splashed a quantity of liquid methyl bromide over his clothes and a little of it reached his face.

On examination, the patient was having recurring convulsive seizures at the rate of about 10 a minute. These affected the jaw, back, both arms, and legs. He was unconscious, and his breath had a pronounced alcoholic odour. The convulsions came on quite suddenly.

The doctors recall that methyl bromide, like chloroform, ethyl chloride and carbon tetrachloride, is not inflammable and its use as an extinguisher depends on its weight—the gas is six times as heavy as air—and its blanketing effect.

Its mode of action depends largely on the concentration. If this is of the order of 10,000 p.p.m. the gas acts as a lung irritant. The results of relatively prolonged exposure would be haemorrhage and oedema of the lung and pleural effusion. Oxygen may be effective in treating this class of case.

After inhalation of a concentration in the neighbourhood of 1000 p.p.m. there are slight non-characteristic symptoms, such as headache, giddiness, fatigue, vomiting, and double vision. There may then be a free interval of hours or even days, followed by the sudden onset of twitching, lockjaw, cramps, double vision, delirium, and raving madness.

No curative treatment is known when convulsions have begun and there is stated to be only one instance of recovery after the onset of convulsions.

Exposure to minimal concentrations of the order of 200-400 p.p.m. results in loss of appetite, nausea, headache, and muscular pains, the symptoms rapidly disappearing on cessation of exposure. Prolonged application of methyl bromide to the skin may lead to burning. It is clear, however, that this does not always happen, as workmen have used it to remove grease from their hands without ill effect. There is, in fact, a strong suggestion of idiosyncrasy.

One feature common to all the reported cases the present authors have studied is its occurrence in an enclosed space, such as a ship, covered railway wagon, or workshop.

MINIATURE MAGNETIC BAR STIRRERS

(*continued from previous page*)

walled glass tubing, in which the spindle is a snugly-running fit, is the upper bearing, while the point of the needle bears upon D, a portion of a microscope slide.

Rotor E is a slice cut from an ordinary cork and having some 32 ratchet-shaped teeth cut in its circumference. The cutting of these teeth with the aid of a razor blade requires a little practice. The usual fault is low tooth strength, which can be considerably , alleviated by varnishing immediately after cutting.

Rotation is set up by applying suction to side tube F, when the stream of air entering through jet G strikes the rotor tangentially. The method of construction reduces frictional losses to the minimum and, although the device is intended to be used with light filter-pump suction, rapid rotation can be obtained with mouth suction.

A practical point in the making of sealing wax joints to Bakelite is to roughen the surface of the latter with a sharp file.

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PERSONAL

DR. F. SHERWOOD TAYLOR has been appointed director of the Science Museum, London. Dr. Taylor, who is 52, has been curator of the Museum of History of Science at Oxford. He is honorary editor of *Abbix*, journal of the Society for the Study of Alchemy and Early Chemistry, and is also honorary assistant editor of *Chymia*. From 1933-1938 he was assistant lecturer in inorganic chemistry at Queen Mary College, London. The doctor will take up his new duties on October 1.

MR. C. R. MIDDLETON has been appointed manager at Shell's Stanlow refinery, Ellesmere Port, in succession to MR. F. MACKLEY, who has been transferred to head office. Mr. Middleton, who joined the Shell organisation in 1924, has served in practically all the Group Refinery operating areas throughout the world.

The Air Ministry and Ministry of Supply announced this week that AIR CHIEF MARSHAL SIR W. ALEC CORYTON had been appointed Chief Executive, Guided Weapons, a post which has been created at the Ministry of Supply to accelerate and co-ordinate all work in research, development and production in this field. The post of Controller of Supplies (Air) formerly held by Sir W. A. Coryton will be assumed by AIR VICE-MARSHAL J. N. BOOTHMAN, who will become an additional member of the Air Council and be promoted to the acting rank of Air Marshal. Both appointments take effect from September 4.

MR. ERNEST RAMSAY, The Priory, Foxhouse Road, Whitehaven, director of Robert Frazer and Sons, Ltd., iron and steel stockholders, left £18,336, net £17,963.

MR. FREDERICK HARRISON TOOGOOD, Roslin Road, Irby, Wirral, for 34 years with the British Oxygen Co., left £1,158, net £1,074.

Next Week's Events

TUESDAY, AUGUST 29

British Food Fair

London: Olympia. British Food Fair.

WEDNESDAY, AUGUST 30

British Association

Birmingham: Meeting of the British Association for the Advancement of Science. Until September 6.

Industrial Finishes Exhibition

London: Earls Court. Industrial Finishes Exhibition. Until September 7.

EFFICIENT USE OF POWER

"ENERGY in the Service of Man" is the theme of the annual meeting of the British Association for the Advancement of Science which opens in Birmingham next week.

A special exhibition, arranged by the association, was opened by the president, Sir Harold Hartley, at the university last week. Displays indicate developments for the more efficient use of power being made by the National Coal Board, the Gas Council and the British Electricity Authority.

Chemical and physical advances in the carbonising industry are demonstrated by the Gas Council in co-operation with the West Midlands Gas Board, also a full display of laboratory equipment for specialist purposes. Models on view include a gas works of modern design, and a gas turbine (seen in section) working on a closed circuit, using waste heat by means of a heat exchange unit.

The coal section deals progressively with the development of mining from early times to a working model of the latest Samson stripper.

In the electricity exhibit two large-scale models show new methods in power station cooling systems. The exhibition is open until next Tuesday, and then again on September 7, 8 and 9 on conclusion of the British Association conference.

Graz Microchemical Congress

AT the First International Microchemical Congress, organised by the Austrian Microchemical Society, held at Graz last month, much interest was aroused by the new microchemical balance shown by L. Oertling, Ltd., London. This was illustrated on page 119 of the July 22 issue of THE CHEMICAL AGE. In addition to being aperiodic and having weight loading, it provides a direct reading of 1.0 microgram per division of a large illuminated scale projected at eye level within the balance case.

Subsidised Inorganic Fertilisers

Fertilisers eligible for assistance under the Ministry of Agriculture's scheme for encouraging their use on grassland have now been precisely defined, and comprise all the commonly used inorganic fertilisers, namely: Basic slag; compound fertilisers (including nitro-chalk); ground phosphate rock; muriate of potash; sulphate of ammonia; sulphate of potash; superphosphate of lime (ordinary and triple).

OVERSEAS

Plans for Venezuelan Steel

The Venezuelan Development Corporation has contracted with the Salem Engineering Corporation of Canada to survey a site for a steel plant near the Orinoco river and the Guaijana iron deposits.

Canada's Copper Output

In the first half of this year Canada increased her copper output to 133,296 tons from 128,931 tons in the January-June period of 1949, but produced only 61,887 tons of nickel compared with 68,038, reports the Dominion Bureau of Statistics.

Belgian Congo Minerals Plan

A 10-year plan by the Belgian Government for developing the minerals of the Belgian Congo calls for an annual production of 180,000 tons of copper, 20,000 tons of tin, as well as large increases in the production of cobalt gold, silver, industrial diamonds.

Largest Vacuum Flasher for U.S.

According to the M. W. Kellogg Company, a new vacuum flashing unit to be built by them for the Standard Oil Company at Richmond, California, will include a main vessel 80 ft. high and with a maximum diameter of 27 ft. whose capacity, it is believed, will be 15 per cent greater than any existing vacuum unit. The new unit will be able to charge 55,000 barrels of reduced crude oil a day.

Manganese in Bihar

The discovery of extensive manganese ore deposits in Kalahandi, Bihar, with total reserves estimated at 1 million tons, has been reported in the quarterly report (January-March) of the Geological Survey of India. Prospecting was carried out in respect of the bauxite deposits in Tungar Hill, Bombay, and geophysical investigation of a copper area in Madras was conducted.

U.S. Aluminium Production

Output of primary aluminium in the U.S.A. in May reached 61,929 short tons, the highest domestic production since July 1944. The average daily rate reached nearly 2000 tons, according to the U.S. Bureau of Mines. Stocks at the end of the month were 16,341 short tons, an improvement of 2704 tons on the figures at the end of April. The first change in price of virgin aluminium for 19 months was announced on May 19 by the Aluminium Co. of America with a rise of one-half cent a pound.

Glass Arrests Atomic Radiation

Two types of glass which can be used in spectacles to protect the eyes from atomic radiation are reported to have been developed by scientists at Pittsburgh University, U.S.A. They will be used by workers in atomic laboratories.

Utrecht International Industries Fair

At the 55th International Industries Fair, to be held at Utrecht, Holland, from September 5 to 14 inclusive, two of the largest sections will be devoted respectively to pharmaceutical products and medical instruments and equipment.

Indian Board of Engineering

A board of India engineering research to function as an advisory body to the governing body of the Council of Scientific and Industrial Research has been formed in India. Its main functions will be to initiate and co-ordinate research work in the various branches of engineering.

Unwanted Arsenic

Swedish exports of arsenic are falling, it has been announced by the Boldens Gruwx A/B, the only Swedish firm producing arsenic. The reason given is that arsenic is less used in agriculture than formerly and supplies can now be obtained from a variety of sources. The company announces that it has thousands of tons on its hands for which there appears to be no likely consumer.

Swedish Iron Sponge Method for Venezuela

The so-called iron sponge method may, according to *Svenska Dagbladet*, be used in exploiting the immense iron-ore deposits recently discovered at Cerro Bolivar, formerly known as Mt. La Parida, south of the Orinoco River in eastern Venezuela. This application of the method has been developed by Professor Martin Wiberg, of the University College of Technology in Stockholm, and is now practised at the Söderfors plant in Central Sweden. Here both charcoal and coke are employed in extraction with the aid of electric power. Since coal and other power resources are limited in Venezuela, while crude oil is abundant, experiments are taking place with a view to adapting the Swedish method to oil. The plans have been drawn up in co-operation with Dr. Magnus Tigerschiöld, of Sweden's Iron Masters' Association, who recently visited Venezuela at the invitation of the Government there.

The Chemist's Bookshelf

THE PETROLEUM CHEMICALS INDUSTRY, by R. F. Goldstein. Foreword by Professor Sir Robert Robinson. London, E. & F. N. Spon, Ltd. Pp. 449. 63s.

At the present time, when the foundations of a large petroleum chemicals industry is being laid in this country, it is appropriate that a volume such as this, from the pen of a British author, should be published.

The book is concerned with the manufacture of synthetic organic chemicals based on petroleum as the starting material. This, as the author points out, is the third and newest of the three principal basic raw materials, coal, vegetable matter and mineral oil, from which almost all industrial organic compounds are manufactured.

Before the war, we in this country were many years behind the Americans in the "know how" of petroleum chemistry. In fact, the setting up of a petroleum chemicals industry over here would have met with great difficulty because of the duty on hydrocarbon oils then in existence. After the war, the realisation of the importance of such an industry to this country led to the abolition of this duty and the opening of the door to British firms. The oil companies were quick to take advantage of this. Chemical plant for this new industry is now springing up all over the country, and is a heartening sign of the flourishing state of the British petroleum chemicals industry.

In this volume the author has endeavoured to survey the field of industrial organic chemistry in which oil is the most economic starting material, but to make the competitive position reasonably clear, information on alternative non-petroleum routes has been included, where appropriate. It has also been considered worth while to include subjects where the oil route has not yet been established as the most economic one, but where improvements in technique may swing the balance in its favour.

To keep the book within bounds, the choice of subject matter was highly selective. Although the chemistry of petroleum derivatives leads predominantly to aliphatic compounds, the manufacture of aromatic hydrocarbons from petroleum is dealt with in some detail. The chemical developments based on these petroleum aromatics are, however, excluded. Similarly, the manufacture of raw materials from petroleum for the high polymer industry is referred to, but the polymerisation step is not discussed.

The chemistry and technology of the petroleum industry, which deals mainly with the manufacture of fuels and lubricants from crude petroleum, has been discussed only in so far as it is relevant to the petroleum chemicals industry: manufacture of carbon black, which is based almost exclusively on petroleum, but which does not lead to synthetic organic chemicals, has not yet been included.

The book is divided as follows: Chapter 1 deals with the source of materials of the petroleum chemicals industry, the hydrocarbons present in crude petroleum or produced as by-products in the refining operations. Chapters 2-5 deal with the chemistry of the paraffins, and Chapters 6-10 with the manufacture of olefins and the chemical developments based on them. The manufacture of the other important classes of hydrocarbons—diolefins, naphthenes, aromatics, and acetylene—are discussed in Chapters 11-14.

In Chapters 15-19, the manufacture and reactions of the principal petroleum chemicals are considered. Chapter 20 gives a brief summary of the chemical by-products —usually non-hydrocarbon—arising from refinery operations.

There are appendices containing useful statistics relating to world petroleum production and consumption and the manufacture of synthetic organic chemicals of non-coal tar origin in the U.S.A.

The book is well printed and has ample diagrams to illustrate the manufacture of the more important chemicals. There is a very full subject index.

For the student, research worker, and for the many people in the petroleum chemicals industry, this book will fill a great need.—R.C.

Book Received

THE CHEMISTRY OF THE ACETYLENIC COMPOUNDS. Vol. 2. The Acetylenic Acids. A. W. Johnson. 1950, London: Edward Arnold & Co. Pp. xxvii+828. 50s.

HOME

Lead Price Raised

An increase in the price of good soft pig lead by £8 from £104 to £112 a ton delivered, was announced by the Ministry of Supply on Tuesday, August 22.

Examination Successes

The Pharmaceutical Society announces that 86 men and 47 women passed its intermediate examination held in Scotland in July.

Coal Production

Britain's output of both deep-mined and opencast coal last week was lower than in the corresponding week last year. Comparing figures are: Last week: 3,958,500 tons (deep-mined 3,699,200 tons, opencast 259,300 tons); August 20, 1949: 4,010,000 tons (deep-mined 3,748,300 tons, opencast 261,700 tons).

Chadwick Public Lectures

The Chadwick trustees announce the 38th annual series of public lectures, as follows: September 21, St. Mary's Hospital Medical School, London; October 3, Art Gallery, Plymouth; October 24, Westminster Hospital Medical School, London; November 14, Royal Sanitary Institute, London; December 5, Royal Society of Tropical Medicine and Hygiene, London.

British Platinum for U.S.A.

A shipment of 34,000 troy ounces of plantinum from British Government stocks for the American raw material reserves has arrived in the U.S.A. The sale was negotiated under the Economic Co-operation Administration agreement between the U.K. and the U.S.A. This provides that 5 per cent of the British counterpart fund must be set aside for ECA administrative purposes and for the purchase of scarce raw materials.

Dearer Copper

The price of electrolytic copper was raised on August 22 from £186 to £202 a ton delivered consumers' works. Buying price for rough copper in slabs of from 2 to 3 cwt. was also raised from £144 to £156 a ton, discounts, premiums, and charges for forward delivery remained unchanged. The increases were made to safeguard the position of the Ministry of Supply in view of the rise in copper prices made by U.S. producers and pending discussion with the Northern Rhodesian producers under an agreement made with them last July.

K.I.D. Exemptions

The following items have been exempted from Key Industry Duty for the period beginning August 24 and ending December 31, 1950: Disodium dihydrogen pyrophosphate (a sodium phosphate), heptoic acid, pyrocatechol, succinonitrile. The order is the Safeguarding of Industries (Exemption (No. 9)) Order, 1950, and is published as Statutory Instruments 1950, No. 1389.

Revised Belting Standard

The British Standards Institution announces a revision of the war emergency standard B.S. 351, relating to friction surface rubber transmission belting, which it has just issued (2s. post paid). The document provides four fabric weights for use in the construction of belting, and gives full constructional details and test requirements. It incorporates appendices dealing with service conditions.

Spreading Fertiliser from the Air

The first full-scale top dressing of hill and marginal land by an aeroplane equipped with a six-ton hopper is expected to take place in the Plynlimon highlands, Cardiganshire, at the end of this month. The 'plane will make eight flights in two days scattering nearly 50 tons of lime and phosphate dressing. The Minister of Agriculture (Mr. Tom Williams) and representatives of the Colonial Governments are expected to witness the demonstration.

U.K. Light Metal Statistics

Ministry of Supply Statistics relating to U.K. production, imports and consumption of light metals in June include the following (in long tons):—Virgin aluminium: production 2455, imports 18,343. Secondary aluminium: production 6918. Aluminium scrap arisings 7248, consumption 10,222. Aluminium fabrication 19,073, foil 1004. Magnesium fabrication 319. Production and imports of virgin aluminium were both less than a year ago.

Refinery Column's Tunnel Trip

Special traffic arrangements were put into operation in the Mersey tunnel recently to enable a huge tubular column driven by two tractors to pass through on its way to the new Shell Mex oil refinery at Stanlow where it is to be installed as a refiner. Measuring 95 ft. by 8½ ft. and weighing 50 tons, the column took up the two lanes normally used for traffic to Birkenhead.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ANGLO-DUTCH PETROLEUM CO. (WESTERN), LTD. London, E.C. (M., 26/8/50). July 21, £5000 mortgage, to Credit for Industry, Ltd.; charged on property known as Regent Garage & Filling Station, 409 Prince Regent Lane, Plaistow. *Nil. October 5, 1949.

BATTERY CONSTRUCTION, LTD., Bridgwater. (M., 26/8/50.) July 21, £6000 debenture to N. Pensabene-Perez, Nassau, Bahamas; general charge. *Nil. December 8, 1949.

CLAY & SON, LTD., London, E., fertiliser manufacturers. (M., 26/8/50.) July 12, mortgage and a deed both securing £2010 and further sums not ex. therewith £40,000, to Westbourne. Park Building Society; charged on land and factory at Marshgate Lane, West Ham. *£6000. October 15, 1947.

CRAYONNE, LTD., Bexley, manufacturers of plastic and moulding materials. (M., 26/8/50.) July 20, mortgage, to Martins Bank, Ltd., securing all moneys due or to become due to the bank; charged on property known as St. Bernard Works, Bexley, with plant, machinery, etc. *Nil. April 6, 1950.

WENLOCK LIME CO., LTD., Birmingham. (M., 26/8/50.) July 21, £3600, £4500, £4050, £4050, £4500, £4500, £4500 and £4500 mortgages, to Dudley & District Benefit Building Society; charged on properties. *Nil. December 31, 1947.

Satisfactions

HADDON CONCRETE CO., LTD., Nottingham. (M.S., 26/8/50.) Satisfaction July 26, of charge registered August 15, 1949.

MURRAY & MCCONACHIE, LTD., Winchester, chemists. (M.S., 26/8/50.) Satisfaction July 24, of charge registered August 25, 1947.

WILLIAM TOLSON, LTD., Fazeley, bleachers, dyers, etc. (M.S., 26/8/50.) Satisfaction July 24, of series of debentures outstanding July 1, 1908.

Company News

E. Griffiths Hughes, Ltd.

Consolidated profits of E. Griffiths Hughes, Ltd., and its subsidiaries, for the year ended March 31, amounted to £390,297, from which the directors recommend a final dividend of 7½ per cent should be paid on the ordinary shares, making 10 per cent for the year.

London Aluminium Co., Ltd.

The London Aluminium Co., Ltd., announces that there will be no interim dividend for 1950 on the ordinary shares. For 1949 the payment was 30 per cent. The directors state that the company has traded at a satisfactory profit for the year but that cash resources should be conserved. Its long-term policy will be to build up substantial reserves associated with the expansion of the engineering side of its activities. Orders on hand are stated to be sufficient for the firm's production capacity for some months ahead.

Triplex Safety Glass Co., Ltd.

The Triplex Safety Glass Co., Ltd., is raising its dividend by 2½ per cent by paying 1s. 3d. per 10s. unit, or 12½ per cent less tax, for the year ended June 30. This compares with 1s. per unit for each of the three preceding years. Gross group profits totalled £186,306, against the previous year's £143,786.

Increase of Capital

An extraordinary general meeting of Albright & Wilson, Ltd., will be convened shortly at which stockholders will be invited to approve an increase in the authorised capital of the company. Subject to such approval and the consent of the Treasury it is the board's intention to make an issue of 2,023,164 five per cent cumulative preference shares of £1 each at 20s. per share and to offer the same for subscription to the holders of ordinary stock by means of renounceable letters of rights in the ratio of one preference share for every two ordinary stock units of 5s. each held on an appointed date. Further particulars will be announced in due

Chemical and Allied Stocks and Shares

GILT-EDGED stocks resumed their advance this week and 3½ per cent War Loan at over 95 reached its highest level this year. The better news from Korea helped market sentiment generally, although there was no marked improvement in the volume of business. Talk of a big new Government issue to finance rearmament is now regarded as probable in due course. Meanwhile, British Funds are attracting attention as the best safety-first holding until the general investment outlook can be better clarified. Leading industrial shares have strengthened a little, taking their tendency from that in gilt-edged stocks, although movements generally were small and have not exceeded more than a few pence.

Chemical and allied shares were generally better where changed, partly because of more general recognition in the City of the important part the industry will play in the rearmament programme. Imperial Chemical have risen sharply to 43s. 3d. Monsanto kept steady at 49s., Fisons at 26s. 6d., and Albright & Wilson, at 30s. 6d., were steady, following news of the company's plans to raise £2 million by a rights issue of 5 per cent preference at par to shareholders. Boake Roberts kept at 29s. 9d. In his annual statement, Mr. E. J. Boake tells shareholders that plans to capitalise part of the reserve fund are for the time being frustrated by the ban on free share issues of ordinary shares.

Brotherton 10s. shares eased, but later strengthened to 19s. 10½d. Amber Chemical 2s. shares were 3s., F. W. Berk 2s. 6d. shares 10s. 3d., Bowman Chemical 4s. shares 5s. 3d., Pest Control 5s. shares 6s. 9d.. Laporte Chemicals 5s. units 10s. 1½d., and Lawes Chemical 10s. 3d. British Chemical & Biologicals 4 per cent preference were 17s. 3d., W. J. Bush ordinary 81s. 3d., and L. B. Holliday 4½ per cent preference 19s. 6d.; Woolley 4½ per cent debentures kept at 104½.

Reflecting the better tendency on the Stock Exchange, British Aluminium firmed up to 41s.. Birmid Industries advanced to 85s. and British Glues & Chemicals 4s. shares further strengthened to 25s. Triplex Glass, however, despite good results and higher dividend, came in for profit-taking and the 10s. units, after touching 24s. 9d., reacted to 23s. 6d. United Glass Bottle kept firm at 75s.

Borax Consolidated were 54s. 3d., British Oxygen 95s. 8d.. and United Molasses improved to 42s. 9d.; the 4s. units of the Distillers Co. were up to 19s. in anticipation of the full report and accounts. Turner & Newall also moved better at 80s. 3d., Associated Cement improved to 84s. 6d., and paint shares recorded moderate gains. Pinchin Johnson at 39s. 6d. were good on the full results and the chairman's statement that the company is likely in due course to segregate its overseas assets.

Boots Drug rose further to 48s. 9d. and Glaxo Laboratories were close on 47s. Levers, after easing, firmed up to 39s., and there were small gains in shares of companies connected with plastics. British Xylonite were 73s. 9d., and British Industrial Plastics 2s. shares 5s. 4½d. De La Rue strengthened to 25s. 3d. on the full results; the chairman indicates in his statement that later on more capital will be required, partly because of preparations in hand to repay the bank overdraft. Oils have been steadier with Shell at 62s. 6d. and Burmah Oil 55s.

Scottish Chemists' Withdrawal

AT a private meeting last week chemists in Edinburgh, the Lothians, and Peebles, authorised the Pharmaceutical Standing Committee (Scotland) to withdraw their services from the National Health Service. The resolution will be placed before a meeting of the Scottish Pharmaceutical General Council in Edinburgh on August 30. The meeting followed the introduction of regulations by the Secretary of State for Scotland giving him power to alter chemists' rates of payment under the service.

Technical Publications

ANODES for the plating trade are the subject of a 12-page booklet recently issued by the Federated Metals Division of the American Smelting and Refining Co., New York. Regular anode products of the division include those of chill-formed and electrodeposited copper, also anodes of lead, zinc, tin, brass and cadmium

* * *

FIRST production of polystyrene in the United Kingdom (THE CHEMICAL AGE, 63, 81) at its Newport factory is described in "The Autoclave" (Vol. 2, No. 4), house magazine of Monsanto Chemicals, Ltd. With this issue the journal completes its first year of publication.

Prices of British Chemical Products

Supply Position Satisfactory

THE market for industrial chemicals continues to show a greater activity than is usual for the period, the present movement being mainly due to the desire on the part of consumers, under the present uncertain conditions, to cover their forward requirements. Despite the overall increased demand, there has been no evidence of a tight position in any section of the market and, in fact, the supply position appears to be comfortable. So far as prices are concerned, the tendency is towards higher levels and the upward movement in the quotations for non-ferrous metals has necessitated adjustments in the quotations for the chemical compounds. White lead and red lead, which were increased a week ago to £131 10s. per ton and £122 10s. per ton respectively, have been further advanced, at the time these notes were written, to a basis price of £138 10s. per ton for white lead and a basis price of £130 per ton for red lead. The demand for coal tar products has remained brisk and shipments of tar acids to the U.S.A. have been satisfactory. There have been no price changes reported, but the undertone is very firm.

MANCHESTER.—A firm tone has continued in virtually all sections of the Manchester market for heavy chemical products during the past week. The demand for soda ash and other alkalis on home consumption account has been on steady lines and good deliveries are being taken of these, as well as of a wide range of other products. On the export side, a fair number of new inquiries has been dealt with. Moderate buying interest has been reported in the fertiliser materials. In the market for tar products reasonably steady trading conditions has been experienced in most sections, especially in the light distillates.

GLASGOW.—There has been considerable activity in the Scottish market owing to the fact that there is a tendency for certain heavy chemicals to become scarce, no doubt influenced by the international situation. The export market remains fairly steady.

Price Changes

Rises: Ammonium bicarbonate, ammonium sulphate, compound fertiliser, "nitro-chalk", red lead, white lead, litharge.

Reduction: Bleaching powder.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £47 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£160 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4¾d. per lb. Crimson, 2s. 6¼d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£144 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£135 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 9d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11½d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Sulphate.—£52 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iron Sulphate:—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £122 10s.; orange lead, £134 10s. Ground in oil: red, £144 5s.; orange, £156 5s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £131 10s. per ton. Ground in oil, English, under 2 tons, £150.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£122 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal,

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500). ton lots, carriage paid, £63 10s. per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7 8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 5s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £121 10s.; green seal, £120 10s.; red seal, £119.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb, according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 8s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 17s. I.C.I. Special No. 1, £19 9s. National No. 2, £11 0s. 6d. per ton

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5½d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol 98/100%.**—Nominal.

o-**Cresol 30/31° C.**—Nominal.

p-**Cresol 34/35° C.**—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: August 22. The prices of all refined oils and fats remain unchanged during the eight-week period ending October 7. The prices of all unrefined oils and fats remain unchanged during the four-week period ending on September 2.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the preparation of prolonged effect insulin products.—Nordisk Insulin-laboratorium. Dec. 20 1945. 643,268.

Apparatus for charging fibrous material into a digester.—Kamyr A/B, and J. C. F. C. Richter. Dec. 28 1945. 643,201.

Apparatus for heating and controlling the temperature in a continuously operated digester.—H. G. C. Fairweather. (Kamyr A/B). Dec. 28 1945. 643,269.

Central refrigerating plant.—Permans Patenter A/B, and P. E. Perman. May 3 1946. 643,207.

Production of vitamin preparations, and their related by-products.—Severoceske Tukove Zavody (Drive Jiri Schicht) Narodni Podnik. Aug. 9 1946. 643,009.

Methods of sizing textile yarns.—Monsanto Chemical Co. Nov. 8 1946. 643,273.

Tri-and tetrasubstituted biguanides and method of preparing same.—American Cyanamid Co. Nov. 20 1946. 643,012.

Retorts for sterilising by heating and subsequent cooling of food in closed receptacles.—K. Omsted. Dec. 13 1946. 643,276.

Combustion apparatus.—Babcock & Wilcox, Ltd., and C. H. Sparks. Jan. 14 1948. 643,279.

Methods and apparatus for reactivating bonechar.—Refined Syrups & Sugars, Inc. Feb. 28 1947. 643,282.

Polymerisation of organo-siloxanes.—Corning Glass Works. March 3 1947. 643,018.

Apparatus for making soda water.—Z. Kaszab. March 27 1947. 643,020.

Gas filter cleaning devices.—Svenska Flaktfabriken A/B. April 3 1947. 643,021.

Lubricating protective oils having anti-corrosive properties.—C. C. Wakefield & Co., Ltd., E. A. Evans, J. S. Elliott, J. Arnold, and P. W. L. Gossling. March 31 1948. 643,025.

Preparation of a nodulated support for a catalyst.—Gas Light & Coke Co., R. H. Griffith, J. H. G. Plant. June 1 1948. 643,159.

Methods of forming selenium rectifiers.—British Thomson-Houston Co., Ltd. July 29 1947. 643,165.

High boiling esters of unsaturated aliphatic alcohols and process of preparing same.—American Cyanamid Co. Aug. 5 1947. 643,033.

Corrosion-preventive compositions.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 5 1947. 643,034.

Manufacture of co-polymers.—J. Downing, and J. G. N. Drewitt. Aug. 6 1948. 643,169.

Glass forming apparatus.—Sylvania Electric Products, Inc. Aug. 6 1947. 643,080.

Hardness testers.—W. A. Williams. Aug. 21 1947. 643,286.

Processes for the treatment of hydrocarbon oils.—V. Weinburg. Sept. 4 1948. 643,287.

Method of and apparatus for storing and dispensing liquified gases.—J. G. Gaunt. (Linde Air Products Co.). Sept. 22 1947. 643,035.

Infra-red analysing apparatus.—C. A. Parsons & Co., Ltd., and A. E. Martin. Sept. 29 1948. 643,086.

Electric accumulator batteries.—H. O. Gazda, and L. Viecelli. Oct. 14 1947. 643,087.

Preparation of 2 : 6-Dihalogeno diphenyl ethers.—Glaxo Laboratories, Ltd., E. T. Borrows, and J. C. Clayton. Oct. 5 1948. 643,089.

Hard metal pieces having inserts of a machinable metal or alloy of high melting point.—Murex, Ltd., and R. W. Rees. Nov. 10 1948. 643,039.

Preparation of mixed mercaptal acetals.—General Aniline & Film Corporation. Dec. 8 1947. 643,041.

Method of producing diazotype images and diazotype materials therefor.—General Aniline Film Corporation. Dec. 9 1947. 643,042.

Apparatus for the preparation of carbon dioxide baths.—P. L. Derome. Dec. 15 1947. 643,044.

Polymerisation processes and the products obtained thereby.—Monsanto Chemical Co. Dec. 17 1947. 643,045.

Process for the preparation of hydroxyacylaminoazo dyestuffs.—Sandoz, Ltd. Dec. 18 1947. 643,046.

Microscopy.—F. H. Smith. Jan. 24 1949. 643,048.

Washbottle for laboratory and other use.—J. Polacek. Dec. 27 1947. 643,182.

Manufacture of iron-antimony alloys.—D. Primavesi. Dec. 29 1947. 643,049.

Process and device for cooling powder yielded by the pulverisation drying process.—Luwa AG, and C. Andermatt. Dec. 30 1947. 643,184.

Electrical devices having vitreos envelopes with electrodes therein.—Westinghouse Electric International Co. Jan. 6 1948. 643,052.

Conditioning of anthraquinone vat dyestuffs.—L. Berger & Sons, Ltd. Jan. 18 1948. 643,291.

Process for the preparation of dis- and poly-azo dyestuffs.—Sandoz, Ltd. Jan. 15 1948. 643,054.

Electrolysis of alkali metal salts.—I.C.I., Ltd. Jan. 19 1948. 643,098.

Optical observation and illuminating means for medical and technical purposes.—A. Burren-Glauser. Jan. 21 1948. 643,099.

Means for the suppression of explosions and the prevention or extinction of fires.—Graviner Manufacturing Co., Ltd., W. G. Glendinning, and A. M. MacLennan. Jan. 28 1949. 643,188.

Therapeutic substances.—J. F. Arens, D. A. Van Dorp, W. Bradley, and M. Gayler. Feb. 11 1949. 643,055.

Therapeutic substances.—J. F. Arens, D. A. Van Dorp, W. Bradley, and M. Gayler. Feb. 11 1949. 643,056.

Homogeneous flaked catalyst composition and its preparation.—Seymour Manufacturing Co. Feb. 17 1948. 643,109.

Lubricator.—C. A. Norgren Co. Feb. 24 1948. 643,058.

Diazotype photoprinting materials.—General Aniline & Film Corporation. March 15 1948. 643,063.

Eethyl cellulose hot-melt coatings.—Hercules Powder Co. March 31 1948. 643,064.

Artificial ageing and maturing of alcoholic liquors.—Alchemy, Ltd., and F. J. E. China. Feb. 10 1949. 643,068.

Method of preparing tris (trimethylsilyl) borate.—British Thomson-Houston Co., Ltd. May 6 1948. 643,298.

Preparation of prolonged effect insulin products.—Nordisk Insulinlaboratorium, and A. Abbey. Sept. 18 1947. 643,300.

Production of gamma-ferric oxide hydrate and gamma-ferric oxide.—Columbian Carbon Co. June 14 1948. 643,303.

Method of electrolytically forming silver chloride.—Burgess Battery Co. June 21 1948. 643,238.

Coating compositions.—Columbian Carbon Co. July 9 1948. 643,308.

Developer for the positive photographic diazotype-process.—L. Van Der Grinten Chemische Fabriek. July 9 1948. 643,309.

Co-polymerisation products.—J. Downing, and J. G. N. Drewitt. Jan. 5 1949. 643,198.

Process for the manufacture of higher alcohols.—N.V. De Bataafsche Petroleum Maatschappij, and H. F. Dammers. July 20 1948. 643,136.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

UNIVERSITY OF MANCHESTER

The next session commences on Thursday, 5th October, 1950.

SITUATIONS VACANT

AN ambitious young man with background of chemical and industrial engineering and accountancy, not more than 35 years of age, and of good education, is required as a **FUTURE WORKS MANAGER.** He will spend a year in the U.S.A. or Canada for special training and return to important executive position in the Manchester area, with fully commensurate salary. Write to Box C.A. 2944, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

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CHEMIST, experienced in modern methods of analysis of Inorganic and Organic Fine Chemicals, is required in October for factory in Western outskirts of London. Particulars, age, education, experience and salary required, to Box No. C.A. 2943, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

EXPERIENCED ENGINEER, with Degree standard in Mechanical, Heating or Chemical Engineering, required as Technical Assistant by leading Chemical Engineering Firm for design and calculations on heat transfer problems and also preparation of tenders, commissioning of plant and technical sales. Previous experience and proven ability in similar work essential. This is a permanent and progressive appointment. Residence in London area necessary. Write, stating age, experience and salary expected, to Box No. CA 2939, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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FOUR SHIFT CHEMISTS required for routine control work in connection with Plastics. Salary according to age, qualifications and experience; generous non-contributory Staff Assurance Scheme. Apply **Personnel Manager, Petrochemicals, Ltd., Partington Industrial Estate, Urmston, Manchester.**

THE Civil Service Commissioners invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER** to be filled by competitive interview during 1950. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. Candidates must have obtained a university Degree in a scientific subject (including engineering) or in mathematics with first or second class honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must, in addition, have had at least three years' post-graduate or other approved experience. Candidates for Scientific Officer posts taking their Degrees in 1950 may be admitted to compete before the result of their Degree examination is known.

Age limits: For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1950; for Scientific Officers, at least 21 and under 28 (or under 31 for established Civil Servants of the Experimental Officer class) on 1st August, 1950. Salary scales for men in London, Senior Scientific Officers, £700 × 25—£900; Scientific Officers, £400 × 25—£650. Rates for women somewhat lower.

Further particulars from the **Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1**, quoting No 2887
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Man's Use of Energy

SIR HAROLD HARTLEY, in his presidential address to the British Association, entitled "Man's Use of Energy", reviewed man's use of and demands for energy throughout the ages, which he pointed out, had helped so much to shape the course of history. With the many new uses of energy, which were being found every day, and the growing population, the world's demands were rising constantly. The question he had to deal with was, how could those demands be met?

Sir John Russell's problem last year of the world's demand for food was simple compared with his (Sir Harold Hartley's). There was, however, a limit to the capacity of the human stomach, but none to a man's appetite for energy.

In endeavouring to find ways of meeting the world's present and future energy demands one came up against the necessity of estimating how long the world's resources can, in fact, satisfy these growing requirements. Sir Harold opined that the world's reserves of coal were ample for centuries to come. Also, the position of oil at least gave no cause for immediate alarm. Reserves of oil and natural gas were smaller, he said, and harder to define, but fresh fields were being found and there was no need to fear a shortage for several decades.

Before that shortage eventuates, Sir Harold reminded his audience with assurance, synthetic oil from coal and the huge reserves of oil in shale will provide substitutes. He, however, uttered the timely reminder that the world's energy problems of the future are not limited to heat and power alone, and that reserves of fertilisers for the growth of food, and of metals for the machine age in which we live, are of equal moment.

The position of fertilisers, as seen by Sir Harold Hartley, is also a satisfactory one. Fortunately for agriculture, he gave the assurance, the deposits of potash and phosphates will meet the world's needs for centuries, and nitrogen we can fix from the air. The reserves of phophates and potash, however, are most unequally divided, marking the dependence of one country on another.

A much more difficult problem might be presented to the world by the reserves of metals. There would be no lack of iron, aluminium or magnesium, although with lower grades of ore the cost might rise. Estimated reserves of copper, lead, zinc and tin were adequate only for some decades, and if all the world used them at the same rate as the U.S.A. there might be

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s; single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

shortages within ten years. Geologists were not optimistic of finding large new ore fields, and so would be faced with an iron/light alloy metal economy, reserving certain non-ferrous metals for the uses for which they were essential. Here again, pointed out Sir Harold Hartley, the accidental distribution of ore deposits revealed in an acute form the inter-dependance of countries.

Prominent among the problems the world was facing to-day were the claims of the less developed countries. Their needs were transport, fertilisers, irrigation, heat and power—transport to diversify their social and economic pattern, fertilisers to sustain and increase fertility, irrigation to bring the water on which all life depended, and heat and power to develop their indigenous resources.

All that meant fresh demands, mused Sir Harold. The nineteenth century was wasteful of its easily won materials, but now, thanks to the continuous improvements in technique, the world's demands for heat and power were being met largely by greater efficiency. Taking a look into the future, Sir Harold wondered what new means of tapping Nature's stores of energy were likely to emerge and bring it where is was needed.

The unequal distribution of energy sources would, he suggested, make its transport of increasing importance in the future, and here the possibility of transmitting electric power over long distances by high-voltage direct current had passed the experimental stage and was waiting for development. Sir Harold referred to the tides in favoured spots as being obvious sources of energy, and he said it was tantalising to think of the immense amount of energy reaching the earth by solar radiation and the small use we made of it.

Referring to nuclear energy, Sir Harold said its story showed what could be done if science were used lavishly with all the resources of the modern world to penetrate Nature's secrets. Then came the task of using Nature's great storehouse for the good of man. The by-products and radiations of the nuclear plants were so dangerous to life that their operation was only made possible by automatic controls.

Man's hope for the future, as suggested by Sir Harold Hartley, lies in his new understanding of Nature's processes, in his more efficient use of her resources and in the growing recognition of the dependence of one nation on another. And who can disagree with Sir Harold?

Notes and Comments

The British Association

POPULAR interest in science today makes it strange to recall the early struggles of the British Association for the Advancement of Science when it was ridiculed even by *The Times* and Dickens poked fun at it in his "Mudfog Papers," which claimed to be accounts of the meetings of the "Mudfog Association for the Advancement of Everything." Today the "British Ass" is held in universal esteem and its wide appeal is reflected not only in the Press but also in the fact that the B.B.C. is devoting four programmes to this year's 112th meeting in Birmingham. Long experience has shown that local interest is a great asset and Birmingham with its combination of academic knowledge and technical experience has contributed much to science. The chemist, indeed, may consider the location well chosen, for it was in this city in 1746 that the partnership of Mr. Samuel Garbett and Dr. John Roebuck resulted in the production of sulphuric acid by the lead chamber process, the beginnings of chemical manufacture in the modern sense of the term. It is strange that among its wide and diverse activities the British Association has no section devoted to metallurgy, particularly this year, when its host is a city distinguished for its achievements in this branch of science.

Success through Science

THAT the achievement of success in a country's industrial activities is dependent upon their being firmly founded on a scientific basis was the opinion expressed by Dr. A. Parker, director of fuel research to the DSIR, during his lecture on "Man's Use of Solar Energy," at the Midland Institute, Birmingham, last week. This was one of a series of lectures arranged to precede the annual meetings of the British Association. Dr. Parker reminded his audience that the earth had received, and was still receiving, an enormous amount of energy from the sun. The coal equivalent of all the energy resources being harnessed and used by man to meet his needs was about 3200 million tons a year, or an average of about 1.5 tons per person; in the U.S.A. it was more than eight tons per person, and in Great Britain about four tons. In the past, fuels had been relatively cheap and had, in consequence, not been used efficiently, but great advances had been made in the last 50 years in the science and technology of power production and utilisation and further rapid advances would certainly be made in the future. Britain was the first to realise the value of fuel and power and to exploit her coal resources in the development of industry. Other countries with good coal reserves followed, and the U.S.A. also began to exploit her petroleum resources. In consequence, industrial competition had become acute, and national ability, skill and hard work had had to play an increasingly important part in achieving success. "With our native talent," said Dr. Parker, "we can achieve success provided that our activities are based on a foundation of scientific and technical knowledge and research, and that we avoid all unnecessary waste, whether of manpower or material."

Chemistry in Agriculture

IN the survey of British agriculture, published last Monday as a supplement to the *Financial Times*, in an article entitled "The Chemist's Rôle," by Mr. R. W. Haddon, managing editor of *Farmer and Stock-Breeder*, the chemist is given a deservedly liberal measure of praise for his contributions to the solving of post-war farming problems. The author draws attention to the tremendous amount of detailed work, in many cases going back for years, that has culminated in, say, the application of a new principle, or product on a practical scale, the

work which goes on at the universities, in Government laboratories and, possibly most important of all, in the research sections of the big industrial firms concerned. He reviews the strides which chemists have made in recent years in the discovery of effective insecticides, fungicides and weed killers, but he says nothing of the problems which remain to be solved in connection with protecting the life and health of farm workers to whose lot it falls to employ some of these chemical preparations (THE CHEMICAL AGE, *63*, 184). The chemist has done, and is still doing, his job—and doing it very well—but the farmer must back him up. It is all very well to adopt the attitude that the chemist, having discovered these chemicals which are toxic to farm pests and noxious weeds, will assuredly be clever enough to improve upon them and make them sufficiently toxic for their original purpose yet non-toxic—or considerably less toxic—to man. This is not so easy as may be supposed by those uninitiated in chemical matters, and the attitude is one which seeks to ease the conscience of the farmer by relieving him of the necessity for properly instructing his workers in the safe use of toxic chemicals, and a strict oversight in the matter of the wearing of suitably protective clothing.

Technical Skill

THE publication of a report by the Parliamentary and Scientific Committee on "Technical Education and Manpower" indicates that some concern is felt over the matter of training skilled craftsmen to meet Britain's increasing industrial need. The report suggests several methods by which the present unfavourable position could be improved, not the least of them being the necessity for industrial firms to do their share. It is urged that the development of part-time day release from industry should be immediately and more widely supported, that more industrial firms should give training in the "skills" of the various trades and crafts and that permission to qualified men to act as part-time day teachers in technical colleges should be more freely granted. Economically, and in the quality of trained technicians, Britain has not yet recovered from the effects of the last war. From this admittedly sombre viewpoint alone there is a vital urgency for more and better skilled craftsmen. The proposal that industry should do more to train skilled technicians will probably meet with a mixed reception. A fair criticism would appear to be that, while the necessary buildings and equipment are but slowly forthcoming, any action taken by industry must necessarily be hindered and limited to a rate at which the essential buildings are completed. Another contention is that, while there is a relatively small technical element in the secondary education of the young people who will enter industrial employment, there is the unsatisfactory possibility that industry, if it undertakes the task of training skilled craftsmen, will, in fact, have to work with needlessly "raw" material. Both these arguments are reasonably valid and are to some extent allowed for in the recommendations of the report. The lead must come from the top, however, and it is where the report urges changes and improvements that can be effected by the Ministry of Education that it does its best service. Only when sufficient opportunity exists for industry to play its part in the technical education of to-morrow's craftsmen will there be a strong case to be made out against the employers. In the meantime, there is no need for complacency. There is much that industry can do, and if the suggestions contained in the report are acted upon then improvement will come.

New Gas Research Laboratories

The importance of research to the development of the gas industry will be emphasised today (Saturday, September 2) when the central and research laboratories of the West Midlands Gas Board will be opened at Nechells, Birmingham, by Sir Harold Hartley, president of the British Association for the Advancement of Science. Planned in 1938, but delayed by the war, the new building forms an extension to existing laboratories.

CHEMICAL IMPORTS RISE

Engineering Items More

JULY imports of chemicals, drugs, dyes and colours were again marked by substantial increases in most items. The total value for the month was £2,958,829, which was only slightly higher than the figure for June, but was over £1 million more than the same period of 1949.

Gas and chemical machinery, which had shown a decline in June, was one of the largest rises with a value of £51,558 compared with £8,454 in 1949. Despite decreases in potassium sulphate and sodium nitrate, total imports of the potassium and sodium compounds were again higher.

Other notable increases were: carbon blacks £876,150 (£72,279); paints and extenders £546,037 (£159,943); and essential oils £387,807 (£135,465).

	July 1950	July 1949
	Cwt	Cwt
Acetic anhydride	7,348	3,839
Acetic acid	—	4 536
Boric acid	7,200	6,180
Carbolic acid	4,921	—
Value of all other sorts of acid	£34,055	£89,558
	Cwt	Cwt
Borax	25,344	19,000
Calcium carbide		1
Cobalt oxide	804	849
	Tons	Tons
Fertilisers	—	200
	Lb	Lb
Glycol ethers and glycol ether-esters	397 721	420,726
Iodine	—	132,100
	Cwt	Cwt
Potassium chloride	836,514	700,963
Potassium sulphate	19,600	33,000
All other potassium compounds	10,117	1,525
Value of all potassium compounds	£666,130	£587,523
	Cwt	Cwt
Sodium nitrate	23,622	35,896
All other sodium compounds	14,405	7,760
Value of all sodium compounds	£117,112	£53,821
Spirits –		
Chemical manufactures, etc		
Value	£942,637	£452,983
Dyes and Dyestuffs—		
	Cwt	Cwt
Synthetic organic dyestuffs	1,012	783
Extracts for dyeing	2 361	595
Extracts for tarring (solid or liquid)	70 007	72,423
All other dyes and dyestuffs	108	505
Paints and extenders—		
Earth colours (except black)	48,396	45,277
Carbon blacks from natural gas	88,922	22,179
Value of carbon blacks	£376,150	£72,279
	Cwt	Cwt
Other including vegetable, lamp acetylene and bone	17 442	1,557
Value of paints and extenders	£546,037	£159,943
Value of chemicals, drugs, dyes and colours	£2,958,829	£1,943,137
	Lb	Lb
Essential oils (other than turpentine)	434,355	249,240
Value of essential oils	£387,807	£135,465
	Lb	Lb
Synthetic oils	4,996	3,197

(*continued at foot of next column*)

U.K. MISSION TO PAKISTAN

Report on Chemical Industry

PROSPECTS of developing the chemical industry in Pakistan are reviewed in the third part of the report of the United Kingdom Industrial Mission which went to Pakistan in February, now published (HMSO, 7s.).

The mission, which was the result of an invitation by the Government of Pakistan, was led by Lord Burghley and included among its members men with expert knowledge of the chemical, electrical, and textile industries.

In general, the report states, the heavy chemical industry, either in West or East Pakistan hardly seems to offer a fruitful or profitable field for expansion in the near future; heavy chemicals not made already could continue to be imported and the market expanded where desirable by a vigorous selling policy. As and when chemical plants are required in Pakistan there will be no lack of suppliers in the United Kingdom.

There should be ample scope for the erection in Pakistan of small plants in the field of industries allied to the chemical industry, with the intention of importing in bulk and carrying out relatively simple processes, in some cases completely replacing imports, or producing finished products for export where raw materials are at present exported.

When a factory is being set up it is recommended that in many cases the establishment and organisation are better handled by the suppliers of the plant in the early stages and from the outset.

Finally, the mission suggests that a thorough "all-round" training for chemists, rather than a highly specialised and necessarily narrower course, would be to the real benefit both of the individuals concerned and of the chemical industry.

The most serious problem is the present shortage of experienced executives and skilled technicians in Pakistan. The engagement of British technicians on short-term contracts is suggested until a long-term training policy can begin to take effect.

	Cwt	Cwt
Wax, petroleum paraffin wax	79,129	21,277
Value of oils, fats and resins	£10,928,889	£8,548,411
	Tons	Tons
Sulphur	29,050	28,865
Value	£293,534	£237,876
	Cwt	Cwt.
Gas and chemical machinery	7,475	508
Value	£51,558	£8,454
	Cwt	Cwt.
Plastic materials	27,950	18,159
Value	£545,098	£300,904

CHEMICAL-PROOF CLOTHING

Lightness and Durability

COMFORT and durability are the main problems continually confronting the manufacturers of chemical-proof clothing. Production of a lightweight material which is flexible, resistant to abrasion and tearing, and impervious to industrial chemicals is the ideal to be aimed at.

Such a material is claimed by the protective industrial clothing division of the R.F.D. Company. Made of high-grade cotton proofed on both sides with PVC, the product weighs only 8½ ozs. to the square yard. It is simple to clean, and is claimed to be resistant to acids, alkalis, oils and greases, and various miscellaneous chemicals such as aluminium chloride and hydrogen peroxide.

New styles in R.F.D. protective clothing. Generously cut to allow freedom of movement without loss of protection, special attention has been paid to ventilation. Range of garments includes bib and brace overalls, bib type aprons, jumpers, hoods, surgeon's type coats, trousers, wader type trousers, combination suits and laboratory coats and other garments

EXPORT LICENSING

Some Chemical Changes

A NUMBER of changes in export licensing control are made in a Board of Trade Order (Export of Goods (control) (Amendment No. 8) Order 1950) which came into operation yesterday, September 1.

Among the goods which will not require export licences are specified starches, certain essential oils, other oils and fats, putty and aqueous emulsions of bitumen.

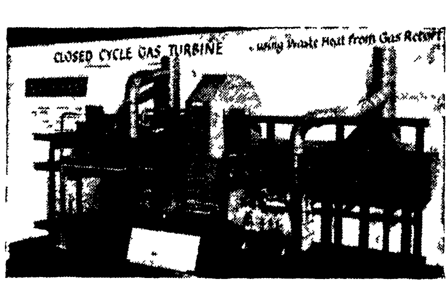
Controls are being tightened over a range of goods formerly freely exported to many European countries. These goods specified in the Third Schedule of the Control of Goods Consolidation Order 1949 (as amended) are mostly chemicals, metals and machinery, and can now only be exported under licence. Styrene and dichlorostyrene have been added to this schedule.

A few drugs have been added to the list of goods which require licences for export to any country.

Birmingham Industrial Museum

APPLICATIONS of science to industrial processes will form a section of the new industrial museum which is to be opened at premises in Newhall Street, Birmingham.

Continuous evolution of methods and machines will be exhibited, with emphasis on progress since the beginning of the Industrial Revolution A search is being made in the West Midlands for 18th century machines to form part of the collection



Model of a new gas turbine, using waste heat on a closed cycle principle, specially made for installation in a gas works. This formed part of the Gas Council's display at the exhibition held in conjunction with the British Association's meetings at Birmingham. A turbine of this type will shortly be installed in a West Midlands gas works

SCIENCE AND THE GOVERNMENT

Work of the Advisory Council

THE work of the Advisory Council on Scientific Policy was outlined by its chairman, Sir Henry Tizard, in an address to a meeting of the Parliamentary and Scientific Committee held on July 25. The terms of reference were quite simple, namely: To advise the Lord President of the Council in the exercise of his responsibility for the formulation and execution of Government scientific policy. It did not detract in any way from existing research organisations but enabled their collective experience to be used on problems which concerned all, but were not specifically the province of any single one.

Examples of problems put before the council were referred to by Sir Henry. One was the introduction of a seaweed indigenous to this country. It was decided the probable danger more than outweighed any industrial advantage. Another important matter still under consideration was that of toxic substances in consumer goods.

The importance of increasing productivity during the next two or three years had resulted in the setting up of the Committee on Industrial Productivity. The problem was now engaging a number of other bodies and the committee did not now feel there was much point in its existence.

Referring to the report of the council on technical education, Sir Henry admitted that although fundamental research was in good hands, there was still cause for some concern when it came to the application of science.

Equipment Value

Availability of capital expenditure was also an important point. Our manufacturing industry was capitalised at a much lower scale than in the U.S.A. At present costs, the capital value of the equipment in manufacturing industries was about £1000 per man employed. In a recent American survey of one hundred of the chief manufacturing firms the capital value of equipment was $12,000 per man employed, *i.e.*, over £4000.

This was one of the chief difficulties which must be borne in mind when comparing industrial productivity in this country with others. It would be a long time before it would be possible to bring up the capital equipment of manufacturing industries to the point it should be, if we were going to keep our position in the world.

The importance of promoting all branches of technical education could not be over-emphasised. The Advisory Council had mainly considered higher technological education. Sir Henry took the view that there should be more institutions of the highest class devoted to research and education in technology. He himself felt it was not at all necessary to have them part of a university: others felt that the universities could cope with the whole problem.

Technical Colleges

In the recent science debate in the House of Commons reference had been made to the Imperial College. There was a difference between that college and the applied science departments of a good many universities, because the Imperial College had a governing body of its own, appointed its own teachers, except professors who were appointed by the University of London, and set its own examinations.

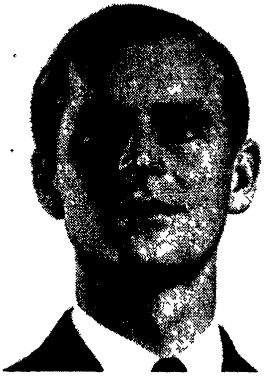
We must aim at a policy of getting colleges similar to the Imperial College set up, but in other parts of the country and in Scotland. If they were to be linked to universities they should, in his view, be modelled on the Imperial College.

With regard to the question of scientific manpower, the Ministry of Labour had made a very careful inquiry into the probable supply of and demand for scientists in various fields in the next three or four years. Figures of supply had been obtained from the universities and care taken to get good estimates of demand, with assistance from expert committees on which prominent scientific men had served.

The conclusion he did not like was that, in general, university departments had expanded sufficiently to satisfy the demand, except in the fields of chemistry and chemical engineering, and in particular that the present rate of output of graduates with biological qualifications may result in a surplus within the next five years.

Sir Henry felt that this might discourage young men who wished to have a biological education from following their inclinations, which was a serious thing to do. We were confused in two ways: inquiries only resulted in finding out the "wants" of people, they did not discover "What does the nation need?"

Chemistry and the British Association
A Well Selected Programme



The Duke of Edinburgh (left), who will be president of the British Association next year on the occasion of the Festival of Britain when the meeting will be held in Edinburgh. Right: Sir Harold Hartley, this year's president

NEARLY 2000 scientists assembled in Birmingham this week for the 112th annual meeting of the British Association for the Advancement of Science which continues until next Wednesday.

"Energy in the Service of Man" is the general theme of the 270 papers being delivered at this year's conference, at which chemistry is again well-represented by a programme covering four main topics: carbohydrates; natural synthetic polymers; chromatography; and differing aspects of chemical energy.

The Chemistry Section

Section "B" was opened on Thursday, August 31, by Professor E. L. Hirst, with his presidential address on "Modern Developments in Carbohydrate Chemistry" (see page 321).

Seaweed polysaccharides formed the subject of the first paper by Dr. E. G. V. Percival, who followed the president. Cellulose, he said, was the only polysaccharide of land plants definitely known to be present. Other "normal" seaweed polysaccharides were laminarin and Floridean starch, both polyglucosans, and a xylan. The polymannuronic acid, alginic acid, was the principle structural component of the brown seaweeds and ethereal sulphates such as carragheenin, containing both *d*- and *l*-galactose, and fucoidin (containing *l*-fucose) were characteristic and unique members of this group of substances.

Professor S. Peat followed with a talk on the enzymes associated with starch metabolism. Most starches consisted of two components, amylose and amylopectin. Both were polyglucoses of the same basic pattern but amylose consisted of unbranched chains of glucose units whereas amylopectin had a branched structure. R-enzyme, a newly-isolated enzyme, alone appeared to be capable of hydrolysing the branch links. The starch-synthesising enzymes were *phosphorlyase* and *Q-enzyme*, which acting together were responsible for the conversion of glucose-*l*-phosphate into amylopectin.

The degradation of high polymers and the importance of this subject in rubber chemistry and in synthetic fibre chemistry in regard to the thermal and photochemical stability of such materials, were emphasised by Professor H. W. Melville at the opening session yesterday (September 1).

Polymer Fibres

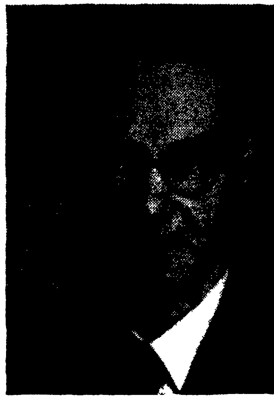
The three main methods of regeneration—the dry, the wet, and the melt spinning techniques—developed in the formation of fibres from polymer molecules were described by Dr. F. Happey in the paper which followed. Physical methods used in the study of these fibres were discussed and some demonstrated in a comparison of the fibre-forming properties of polythene, the nylons, terylene, and the synthetic polyesters and polypeptides.

Papers next week, will deal on Monday with chromatography, the authors being Dr. T. I. Williams, Dr. C. E. Dent and Dr. F. H. Pollard, while on Tuesday chemical energy will be the subject of addresses by Professor F. H. Garner, Dr. James Taylor, Dr. H. J. T. Ellingham and Professor F. G. Gregory.

CARBOHYDRATE CHEMISTRY

Some Modern Developments

Abstract of an address given to section 'B' by Professor E. L. Hirst, Forbes Professor of Chemistry, University of Edinburgh, as president of the chemistry section, at the 112th annual meeting of the British Association now being held in Birmingham



Professor E. L. Hirst

ONE of the main reasons for the comparatively slow progress in sugar chemistry in the early years was the lack of an accurate knowledge of ring structure. It had been assumed, largely by analogy with the stable γ-lactones of hydroxy acids, that a similar five-membered ring occurred in the normal sugars, but as knowledge of the properties of sugar derivatives increased many anomalies appeared and there followed a period of confusion and uncertainty.

The work of Purdie and Irvine, of the University of St. Andrews, however, led the way in the development of carbohydrate chemistry with the observation that by the action of silver oxide and methyl iodide on lactic acid both the carboxyl and the hydroxyl groups underwent methylation. The reaction with alcoholic groups was found to be general and it became possible for the first time to label with easily recognisable groups the free hydroxyl groupings present in carbohydrates. Since these methyl ethers resisted chemical action during subsequent operations, a method was provided whereby the points of junction of the substituents in a sugar molecule could be detected. To use this procedure it was necessary to have ready as standard reference substances a series of partially methylated derivatives, for example, 2:3:6-trimethyl glucose, in which the position of the methyl groups was known with certainty.

Methylation Method

A further stage in the structural investigations was the application of the methylation method to the determination of the nature of the rings present in the sugar molecules. It was used to ascertain the ring structure of the stable α- and β-forms of methylxyloside, obtained from xylose by the action of methyl alcohol in the presence of hydrogen chloride. On methylation or by using dimethyl sulphate and sodium hydroxide, the fully substituted methylxylosides could be prepared without risk of any change in the nature of the ring system and trimethyl xylose was readily obtainable from these by acid hydrolysis.

Pyranose

Trimethyl xylose on oxidation with nitric acid gave the internally compensated optically inactive trimethoxy glutaric acid, and it followed that the ring system present in normal methylxyloside must be a six-membered one containing an oxygen bridge between the first and the fifth carbon atoms. For this type of ring, the designation pyranose was subsequently proposed.

An elaboration of the method fixed the ring structure in α-methylglucoside, since on methylation this gave rise to a tetramethyl glucose, which an oxidation with nitric acid yielded the same inactive trimethoxyglutaric acid. It therefore became evident that the normal derivatives of glucose contain a six-membered pyranose ring instead of the five-membered ring which had previously been assumed. The way was then clear for a general attack on the problem of ring structures in simple and compound sugars.

The ordinary stable varieties of the sugars and their methylglycosides were found to possess the pyranose structure while the unstable, readily hydrolysable methylglycosides, of which Fischer's "γ"-methylglucoside is a typical example,

possessed the five-membered furanose ring.

Efforts were made to determine the ring structures present in the disaccharides, but the problems here are more complicated since it is necessary to determine (a) the nature of the ring present in each of the two residues; (b) the point of junction between the residues; (c) the nature of the glycosidic group involved.

The disaccharides methylation followed by hydrolysis frequently gives only a partial answer to the problem of structure. For instance, the fully methylated derivative of maltose yields on hydrolysis an equimolecular mixture of 2:3:4:6-tetramethyl glucopyranose and 2:3:6-trimethyl glucose. Inspection of the formula of the latter substance shows that free hydroxyls on both C_4 and C_5 are available for the engagement of the ring, and it follows that the isolation of this particular trimethyl sugar leaves open two possibilities for the ring form of the corresponding glucose residue as it occurs in the disaccharide.

Maltobionic Acid

Further evidence is required before a choice can be made between the two alternative structures for the disaccharide which might be either 5-glucopyranosido-glucofuranose or 4-pyranosido-glucopyranose. If instead of the free sugar the open chain derivative maltobionic acid is subjected to methylation, every position in the residue which originally carried the reducing group is now available for substitution, except that carbon atom which is involved in the junction of the two glucose residues. Hydrolysis of the fully methylated maltobionic acid will therefore yield, in addition to tetramethylglucopyranose, a tetramethyl gluconic acid which possesses one free hydroxyl group.

The position of this hydroxyl group fixes the point of junction of the two residues and hence, by taking into account also the isolation of 2:3:6-trimethyl glucose in the direct methylation experiments, the nature of the ring is fixed also. In this way maltose was proved to contain two pyranose residues linked through positions 1 and 4, and other evidence indicated that an α-glucosidic link was involved.

New Structures

By suitable variations of the procedure the structure of lactose (4-β-galacto-pyranosido - glucopyranose), cellobiose (4-β-glucopyranosido-glucopyranose), gentiobiose (6-β-glucopyranosido-glucopyranose), and of other disaccharides and trisaccharides were established. Sucrose (α-glucopyranosido-β-fructofuranoside), one of the most important of the disaccharides, presented special difficulties and some time elapsed before the structure of the fructose portion was established.

The clearest proof that the ring structure is of the furanose type was provided by a study of the action of permanganic acid on the substance obtained by the mild oxidation of tetramethyl fructose. Elimination of carbon dioxide took place and 2:3:5-trimethyl-*D*-arabonolactone was formed. Rotational evidence obtained during hydrolysis experiments gave strong indications that the molecule contains an α-glucosidic and a β-fructosidic group.

It is curious that sucrose has resisted all attempts to synthesise it by purely chemical methods. Despite the most intensive work no trace has yet been found of natural sucrose when the combination of glucose and fructose possessing the correct ring structures has been effected, although an iso-sucrose, differing from the natural product only in the nature of the glycosidic links, can be obtained in this way.

Recently it has been found that α-*D*-glucose 1-phosphate and *D*-fructose give natural sucrose in good yield under the influence of an enzyme present in the bacterium *Pseudomonas saccharophila*, an enzymatic synthesis of cane sugar being thus achieved.

Nucleic Acids

In addition to O-glycosides, nitrogen analogues exist also, formed by the union of a sugar with an appropriate amine. Methods have been elaborated whereby N-glycosides containing the highly reactive *D*-ribofuranose residue can be formed and in this way syntheses of nucleosides and nucleotides have been achieved, including, for instance, adenosine triphosphate. These are of particular importance in connection with the chemistry of the biologically significant nucleic acids and co-enzymes.

The methylation method still remains one of the most valuable of all those available to the sugar chemist, but the carbohydrate molecule is so labile and so versatile in its behaviour and the problems it poses are so complex that the widest possible variety of physical and chemical methods are now required for the determination of structure.

The evidence for the relative dispositions of the α- and β-groups in glucose has been sought by methods so widely divergent as conductivity measurements in borax solution and X-ray crystallographic analysis. The comparative rapidity with which the chemistry of ascorbic acid and its derivatives was worked out depended upon X-ray and ordinary crystallographic measure-

ments and on the study of optical rotatory dispersion in the ultra-violet region, in addition to the classical methods of organic chemistry and novel applications of the methylation process.

(i) $R.CHOH.CHOH.R \xrightarrow{HIO_4} R.CHO + OHC.R$

(ii) $R.CHOH.CHOH\ CHOH.R^1 \xrightarrow{HIO_4} R.CHO + OHC.R^1 + HCOOH$

(iii) $CH_2OH.CHOH.R \xrightarrow{HIO_4} H.CHO + OHC.R$

(iv) $CH_3.CHOH.R \xrightarrow{HIO_4} CH_3.CHO + OHC\ R$

Of other reagents which have found important uses in carbohydrate chemistry, periodic acid is of special significance and the limits of its usefulness have by no means been reached. Like lead tetra-acetate, this substance has the property of attacking glycols which contain hydroxyl groups on contiguous carbon atoms, the carbon-carbon bond being broken with the formation of two aldehyde groups. One or two examples chosen from widely differing problems may be given to illustrate the versatility of the reagent.

(a) Sodium periodate attacks the free sugars, in many instances quantitatively, liberating formic acid, and so providing a convenient and accurate method for the micro-analytical determination of the sugars. Under appropriate conditions terminal $-CH_2OH$ groups yield formaldehyde and $CH_3.CHOH-$ groups acetaldehyde, both reactions finding important analytical uses.

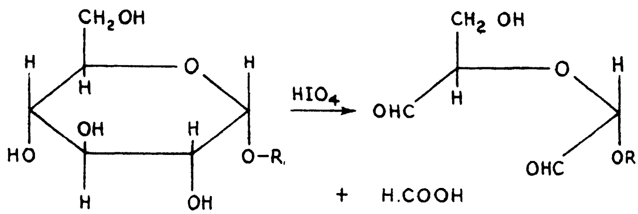
(b) It may often be employed to establish the position of the methyl groups in partially methylated sugars. For instance, an unknown dimethyl mannuronic acid, which was encountered in the course of work on alginic acid, reacted with periodic acid yielding a methylated aldehyde, and the latter on further oxidation gave *i*-dimethoxy succinic acid. The original substance was, therefore, the 2:3 dimethyl derivative of mannuronic acid.

(c) The problem of the disposition of the methoxyl groups round the first carbon atom of the α- and β-forms of the methylglycosides has been studied by the use of periodic acid. In the case of α-methyl-*D*-glucoside many independent lines of evidence point to the arrangement depicted below in which the $-OMe$ group is situated beneath the plane of the ring.

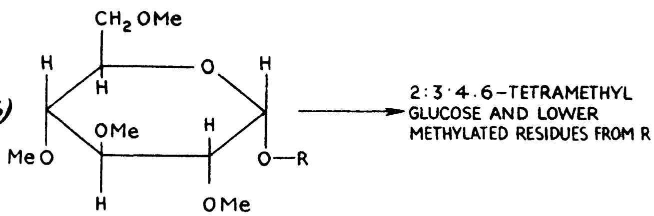
By means of an ingenious application of the use of periodic acid it has been confirmed that this spatial arrangement holds generally for all α-methyl-*D*-hexopyranosides and hence also for the α-forms of the sugars. During the oxidation of the methylglycosides a dialdehyde is formed and on further oxidation with bromine water this readily gives the corresponding acid which can be isolated as its strontium salt. In this the original oxygen bridge is still intact, but the optically active centres at C_2, C_3 and C_4 have disappeared. All α-methyl-*D*-hexopyranosides should, therefore, give the same product and this is found to be the case.

In a similar way β-methylglycopyranosides of the *D*-series, for which the arrangement of the groups round C_1 is enantiomorphic to that present in the α-derivatives, give rise to a product which differs from the strontium salt just mentioned only in respect of the spatial arrangement at C_1.

(a)



(b)



(d) One of the most valuable applications of periodic acid is for the detection and estimation of terminal sugar residues which are present in complex carbohydrates. A

polysaccharide of the structure shown in (A) may be considered, in which there is a terminal glucose residue, attached to the remainder of the molecular structure R, which contains no other terminal groups, reducing or non-reducing, and no residues linked exclusively through their C_1 and C_6 positions.

When such a molecule is oxidised by periodate it is clear that the terminal residue will give rise to formic acid, the amount of which enables a direct calculation to be made of the proportion of the end group in the molecule. Wherever conditions are suitable, this method is particularly convenient since it can be carried out on the micro-scale, permitting end-group determinations to be made in a day or two with only milligrams of material. It has been used extensively to supplement the methylation method for the assay of end groups in amylopectins and glycogens, and other polysaccharides.

Complications arise when the molecule contains free reducing groups or chains of hexose residues linked solely in the C_1-C_6 positions and in such cases there is at present no alternative to the more general, but lengthier, methylation method (B) for the determination of end groups, which was first used in the course of work on cellulose.

(e) Another promising development of the periodate method is its use in the study of complex polysaccharides which contain many branched chains, such as are found in amylopectin, glycogen and in plant gums and mucilages. A terminal hexopyranose residue is attacked with liberation of formic acid. On the other hand a hexopyranose residue which is linked to others solely through its C_1 and C_4 positions will be oxidised to a dialdehyde by periodate, whereas if the links are through C_1 and C_3, the residue will remain unattacked.

Unattacked Sugar Residues

Again, if a branch chain is attached at either of the positions C_2 or C_3 in one of the residues of a long chain of C_1-C_4 linked residues, treatment of the substance with periodate will result in the oxidation of all the sugar residues except that one in which the point of branching occurs. If the oxidised polysaccharide is then hydrolysed, the nature and the amount of the unattacked sugar residues may be determined. These methods have already proved their utility in structural work on the starches and gums.

The application of chromatography to carbohydrate chemistry is of outstanding importance. One of the major difficulties of sugar chemistry has always been that of the qualitative and quantitative separation of mixtures of sugars. These substances resemble one another so closely in physical and chemical properties that separation is always difficult and frequently has to depend on some specific reaction which is, unfortunately, rarely quantitative. Nevertheless, a great deal has been accomplished on these lines, and if sufficient material is available it is usually possible to identify the components of a mixture.

These methods however, demand large quantities and progress in important investigations has been retarded by the difficulty of securing materials on an adequate scale. Similar problems are encountered in the study of polysaccharides by the methylation method when the hydrolysis of the fully methylated derivative may give rise to a complex mixture of monosaccharides of different kinds and of various degrees of methylation.

A New Approach

Much can be done by preferential extraction from solution by immiscible solvents and by fractional distillation under diminished pressure, but it became clear some years ago that the limits of usefulness of these methods were being reached and there was urgent need for a new approach.

This has been provided by partition chromatography which has developed with amazing rapidity in the sugar field since Partridge first applied the filter-paper-strip technique to the separation of simple sugars, using solvents such as butanol-water mixtures for the development of the chromatograms.

Complex mixtures of sugars, including their methylated derivatives, can be separated and determined quantitatively on a scale of milligrams or, in favourable cases, of micrograms. Furthermore, by the use of columns of powdered cellulose and an automatic device for collecting fractions of the eluate, these workers have succeeded in carrying out quantitatively the separation of mixtures on a larger scale, obtaining a sharpness of separation which had hitherto been quite impossible to achieve.

Both in sensitivity and in range the chromatographic methods far exceed the earlier procedures and for the time being the limiting factor in the structural study of the complex carbohydrates resides not so much in the separation and identification of the various sugar residues as in the difficulty encountered in hydrolysing the polysaccharides without damage to the component sugars.

PRIMARY AUTOXIDATION IN OIL DRYING

Chemical Aspects and Mechanism

RECENT research in the field of primary autoxidations in unsaturated fatty acids has been mainly on simple esters or, more rarely, on free fatty acids. Polymerisations are only involved in so far as they are closely connected with this primary autoxidation. That these unsaturated acids are mostly used in the form of triglycerides is relatively unimportant. The fatty acids concerned are those of the linoleic and linolenic type.

A comprehensive review of recent work in that important field was given recently by Professor Wilhelm Franke of Cologne University, at a meeting of the paints, etc., group of the German Chemical Society, in Hamburg. It has now been published in full, with nine curves and 75 references.[1]

The bridge or ethylene peroxide theory of Fahrion and others obtained considerable support in the earlier literature; but in 1936 Rieche opposed this with his hydroperoxide theory. It is here discussed at some length in respect to basic considerations, experimental, and side and supplementary reactions. Oxygen is assumed to enter the CH_2 groups where activated by proximity to double bonds, forming fatty acid hydro-peroxides. Ten years earlier Scheiber had already postulated formation of similarly constituted ketones through autoxidation. Rieche had, in fact, merely transferred to fatty acids the analogous results obtained with cyclic hydrocarbons such as tetralin and cyclohexene; and his theory was subject to the serious objection implied in the drop in iodine number of autoxidised unsaturated fatty acids.

Spectrographic Study

On the experimental side, the important work of Farmer and co-workers to some extent restored the Rieche hypothesis, but on other grounds, based on spectrographic observations by Bolland and colleagues[2,3] working first with a high fatty acid (C_{23}) from fish liver oil, and then with linolenic ethyl ester. Curves show changes in the absorption spectrum and oxygen absorption for linolenic ethyl ester and reference is made to earlier experiments of van der Hulst and to the later research of Kaufmann and Keller who noted the formation of conjugated unsaturated diene and triene fatty acids in vegetable oil stored with air admission. Farmer and co-workers had, however, supposed that the peroxide group as such did not contribute to absorption in the spectrum region of 2300 Å, and this was later confirmed by Bergström.

According to the Farmer theory the first phase of autoxidation of the "methylene-interrupted" double bond system consisted in the freeing of a hydrogen atom from an activated CH_2 group, thus leaving an olefinic radicle stabilised by resonance with two conjugated unsaturated structures, or, as Sidgwick called them, resonance hybrids. These and kindred matters are discussed in relation to the literature, such as the work of Bolland and co-workers Bergström and others, including effect of hydrogenation and the significance of the extinction coefficient (ϵ).

Enzymatic Autoxidation

By way of supplement to the chemical aspects, enzymatic catalysed autoxidation may be briefly noted. In soya beans and other legumes there was evidently an enzyme that could catalyse peroxidation of non-conjugated unsaturated fatty acids, whether in the form of soap solution or ester emulsion. Some recent references (1948-50) are given — Bergström, Holman and others, on isolation in crystalline form of lipoxydase, etc. Some remarkable results are recorded with pure enzyme and at low temperature. Somewhat earlier Franke and Mönch, with linolenic acid oxidation, had found that the hydrogenated products very probably contained 12- and 16-oxystearic acid.[4] It should be mentioned that the frequently noted fall in iodine number accompanying oxygen absorption and the initial peroxide formation is not incompatible with the new conception of autoxidation mechanism.

In discussing side and supplementary reactions, the author points out in the first place that the formation of conjugate unsaturated hydroperoxides may be certainly regarded as the primary principal reaction in the autoxidation of linoleic and linolenic acids. The nature and extent of side or supplementary reactions is, however, less certain. Franke and Mönch and Bergström[5,6] found that, even with relatively low oxygen absorption, higher oxidation products result which, when hydrogenated, yield alpha-glycols to the extent of 20-25 per cent of absorbed oxygen. Among

products isolated were capronic and propionic aldehydes.

Of interest in this connection is the recent observation of Bernheim *et al*[7] that catalysed oxidation of linolenic (not oleic or linoleic) acid yield an oxy-C_3 substance which responded colorimetrically to the thiobarbituric or p-amino-benzoic acid reaction. It should be mentioned that autoxidation of fatty acids is of profound interest in other fields than that of drying oils, and especially in biochemistry, to which several references are made in the present review. It seems likely, despite recent findings to the contrary, that the formation of this split product must be attributed to a primary ethylene peroxide at the double bond—possibly that most remote from the carboxyl—with lead tetracetate as the splitting agent.

Ketone Formation

Formation of ketones is also discussed in reference to work of Bolland and Koch, Bergström, etc., with absorption measurements and other means. Generally, they may be regarded as being caused by dehydration of the primary hydroperoxide; although, as Lundberg and Chipault have surmised, it may not be the stable peroxide that is involved, but one arising from parallel reaction. Temperature appears to be an important factor here. To date, it seems that only what happens to the first absorbed oxygen molecule is known with any certainty: the fate of the second and subsequent molecules is still obscure. It is likely that these subsequent peroxides are much less stable than the primary compounds. The disappearence of a double bond may be only apparent, and iodine values have to be carefully determined and interpreted.

The mechanism of autoxidation is considered under the three divisions of (a) autoxidation as chain reaction, (b) special cases of radicle formation and conversion, and (c) chain-breaking reactions. The first secured fairly strong support almost from the start, on various grounds including acceleration with light, slowing down or inhibition with anti-oxidants. This later led to the enunciation of the radicle-chain theory of Farmer *et al*, involving removal of a hydrogen atom from an activated CH_2 group, already noted. The formulation of this cycle is shown.

Farmer's ideas were further developed by Bolland and co-workers along kinetic and thermodynamic lines under various conditions. Radicle chains were set free by thermal breakdown of the linoleic hydroperoxide, and on kinetic grounds it seemed that, from each two peroxide molecules thus broken down, one chain-freed radicle was formed and one molecule of water was also set free.

The main question here concerns the primary monovalent dehydrogenation of the fatty acid molecule, involving considerable expenditure of energy (about 80 Kcal/mol). The presence, therefore, of "acceptor" radicles is important, and the idea of a "substratum" peroxide or additional labile peroxide appears feasible, as exemplified in the case of dibenzoylperoxide decomposing at higher temperature into the perbenzoyl and phenyl radicles. These radicles may release or weaken the oxidation chain; and this applies to all substances that readily form organic peroxides with oxygen. There is an extensive literature on such catalytic effects.[8]

As to the action of heavy metal driers or siccatives, this has not yet been sufficiently explained. Reference is made to Whittig's formulation of benzaldehyde autoxidation, with metals as hydrogen-acceptors, and to earlier work with ferrous complexes in the biological field, including the possibility (suggested by the author) of secondary activation of fatty acid peroxide molecules. In this connection Robertson and Waters[9] have distinguished between initial and secondary catalysts in the case of tetralin autoxidation. But it is doubted whether this is really necessary.

The special cases of radicle formation and conversion, including the researches of Farmer and co-workers, and of Bolland and Gee on the reaction of a double bond with oxygen, are briefly discussed. Formulation examples are given of primary reaction stages, stabilisation of a di-radicle as bridge peroxide, formation of six-ring structures, and intramolecular reactions. These examples show how easily polymerisations may be explained on the "radicle" hypothesis.

Chain-Breaking Reactions

Finally, on the subject of chain-breaking reactions, Bolland's work is again the main topic of discussion, and his estimate of chain lengths of 50-100 members in autoxidation of linoleic ethyl ester at 45° is noted[10] together with formulations of chain-breaking reactions and dimerisations. The action of foreign (non-system) substances of a phenol nature and of anti-oxidants is also mentioned briefly.[11,12] With a formula for inhibitors; or value of v (initial reaction velocity) in terms of the unrestricted autoxidation, linoleic ester and inhibitor concentration, and a constant (k).

(continued at foot of following page)

THE STORY OF CABLES

Round the World in 53.6 Secs.

THE laying of the first submarine cable across the Straits of Dover on August 28, 1850, between Dover and Calais, marked the origin of a new era in international communications and the foundation of a great modern industry which has, from the outset, been almost entirely British.

To mark the centenary of the event a special exhibition " 100 Years of Submarine Telegraph Cables " was opened this week at the Science Museum by the Postmaster General, Mr. Ness Edwards. A telegram was transmitted by him which travelled round the world and was received back in 53.6 seconds.

The first cable was laid through the enterprise of Jacob and John Brett, who were not themselves scientists, but the exhibition shows that a large part of the credit for the achievement was due to Charles Hancock, who in 1848 patented a method of coating wire with gutta percha for insulation. This remained the only material used for this purpose until the recent application of polythene proved it to be as good an insulator.

Features of the exhibition include scale models of machinery and of cable-laying ships, and arrangements whereby visitors at certain periods may exchange messages with operators in overseas telegraph stations.

The exhibition adds one more to the series of excellent scientific and technical displays organised by the Science Museum which are of interest not only to the expert but also appeal to the lay visitor.

PRIMARY AUTOXIDATION IN OIL DRYING

(*continued from previous page*)

This condensed abstract from the German original serves to show that a wealth of material has been contributed in recent years. But there are still many gaps. Recent work has been mainly in the field of ultraviolet spectrography, and this seems to have somewhat slowed down of late (in the opinion of Franke).

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PEST CONTROL PRODUCTS

First List of Simple Names

AT the beginning of this year, the British Standards Institution made the widespread announcement in the technical and trade Press (THE CHEMICAL AGE, 62, 257) that a technical committee had been appointed to devise simple, common names for well-established pest control products, including insecticides, insect repellents, acaricides, nematocides, fungicides, herbicides and rodenticides. The need for common names which do not conflict with proprietary names was pointed out on account of the considerable confusion which has arisen in commercial descriptions and in the technical literature.

The B.S.I. now announces that this technical committee has prepared the first list, containing some 25 common names for the better-known products now in general use in agricultural and in veterinary circles throughout the country. This list is being circulated for technical comment among Government departments, manufacturers and the interested scientific societies before final publication. In order to pre-empt the use of these names as proprietary names, the list has been lodged with, and approved by, H.M. Patent Office. The names will be given protection and will be referred to when application is made for the registration of proprietary names for pest control products.

U.S. Concurrence

Wherever possible the names adopted conform with those already accepted as coined common names by the U.S. Department of Agriculture, and the same system of protection is given by the U.S. Patent Office. It is hoped that the same measures will extend to other countries in due course.

The chemical names assigned to each compound are in accordance with the principles recommended by the Chemical Society. Where possible, only the pure active ingredients have had common names assigned to them, and an endeavour has been made to avoid, with a few outstanding exceptions, the use of initials and numbers. The exceptions are made in the cases of compounds which are already well known by initials, such as DDT and BHC, since a further name would only increase the confusion.

During the drafting, the technical committee has maintained liaison with the Commonwealth countries as well as with the appropriate committee in the U.S.A.

The Progress of Chemistry

Trends Surveyed by the Chemical Society

THE annual report on the progress of chemistry during the year 1949, has been published by the Chemical Society. This year the report is divided into six sections: General and physical chemistry, crystallography, inorganic, organic, analytical and bio-chemistry.

In previous years the aim has been to give a comprehensive survey of work carried out over a period of years in selected topics. The policy will now be to give a general perspective of the main developments during the year under review. The papers in this report have been preferentially selected so as to be of interest to chemists outside the immediate circle of specialists. The general plan is to give an account of trends in the various branches of chemistry, and the treatment of individual topics is more by reference and is less self-contained than in previous years.

A Time Lag

Because of the decision to change the scope of the report this 1949 publication marks a transition stage and there is a certain time-indeterminacy, aggravated by the fact that some war-time European papers have only recently become available to British workers. Generally speaking, however, the report contains topics from publications abstracted between August, 1948, and July, 1949, inclusive, though it is not wholly restricted to that period. Of the twelve topics dealt with under the heading of " General and physical chemistry " no fewer than ten are contributed by A. R. Ubbelohde. They include " General Thermodynamics and the Evaluation of Thermodynamical Functions for Gases," " Isotope Chemistry," " Bond Structure and Bond Properties," " The Structure and Properties of Liquids," "The Physical Chemistry of Liquid and Solid Dielectrics," " The Physical Chemistry of the Solid State," " Adsorption and Surface Chemistry," " Electro-chemistry and Ionic Chemistry," " Kinetic Studies. Photoreactions and Auto-oxidation," and " The Physical Chemistry of Macro-Molecules." The other two topics in this section are " Magnetochemistry," by R. C. Pink, and " Metals and Alloys. The Pauling Hypothesis," by W. Hume-Rothery.

The section on crystallography is divided into three parts, an introduction and " Crystal Chemistry," by D. C. Hodgkin and " The Technique of Structure Analysis," by G. J. Pitt. The introduction deals with the work being done in this field and the heightening interest shown in crystallography, as instanced by the formation of the International Union of Crystallography and the publication by this union of a new journal for crystallographic papers, *Acta Crystallographica*. Because no formal report on crystallography has appeared since 1946, this 1949 report covers the three years 1947, 1948 and 1949.

Twenty-eight pages of the Report are devoted to the subject of inorganic chemistry, and the topics are discussed under the eight groups of the periodic table. Copper and its compounds in group 1, boron in group 3, hydrogen peroxide in group 6 and fluorine in group 7 are the subjects in which the major proportion of work has been done. The survey is presented by R. E. Dodd and P. L. Robinson.

The organic chemistry section does not attempt to give a true annual report but instead deals with important topics not reviewed for some time. The section is divided into eight parts, including an introduction, which are as follows: " Theoretical Organic Chemistry," by E. A. Brande, " General Methods," " Alkaloids " and " Vitamin A and Related Polythenes " by A. W. Johnson, " Long-chain Aliphatic Compounds " by R. E. Bowman, " Amino-acids," by H. N. Rydon, and " Proteins " by M. V. Tracey.

Significant Advances

Biochemistry comprises two parts devoted to " Haemopoietic Factors " by W. F. J. Cuthbertson and " Carotenoids, Vitamin A and Visual Pigments " by R. A. Morton. C. Rimington, in his introduction to this branch of chemistry, considers that " very significant advances have been achieved during 1949."

The last section, on analytical chemistry, consists of seven parts. The introduction, " Gravimetric Analysis " and " Organic Reagents in Inorganic Analysis " are by H. Irving, " Radioactivation Analysis " and " Gas Analysis " are contributed by A. A. Smales, and the other two parts are " Analytical Applications of the Raman Effect " by L. A. Woodward and " Analysis of Organic Compounds " by G. Ingram and W. A. Waters.

NEW PROCESS FOR SULPHUR PRODUCTION

British Survey of Desert Lakes

PRODUCTION of sulphur by new methods and the development of a new industry in Great Britain may result from investigations now being carried out.

Two scientists from the Chemical Research Laboratory, DSIR, have recently completed a survey of lakes in Libya in connection with the research. These desert lakes are full of micro-organisms known as sulphate reducing bacteria which reduce sulphates to sulphides. Sulphur can be produced from hydrogen sulphide by simple aeration. The rate of production of sulphide is low and to make the process economically feasible it is necessary to speed up the reduction of sulphates to about ten times its normal rate. The research has this object in view.

Three methods of research will be used. Strains of bacteria from various parts of the world will be examined for their speed of reduction, the influence of different environment will be investigated and methods of obtaining possible quick reducing strains by artificial means will be explored. The sulphate reducing bacteria were originally studied in detail in this country because of their corrosive action on buried pipes.

The two scientists engaged on this research, Mr. K. R. Butlin and Mr. J. Postgate, have been examining lakes in Tripolitania and Cyrenaica. From a report received in 1949 it seemed likely that sulphur was being produced in these lakes in fair quantity by biological processes and that an examination of them would yield information and cultures of scientific interest.

A "Desert Laboratory"

Accompanied by Arabs, who drove the trucks and cooked, Butlin and Postgate visited several lakes near El Agheila. They were in the desert for a week and took with them a special "desert laboratory" which had been designed and made in the CRL workshops.

Four lakes were examined, and samples taken for later work at the CRL. The scientists found that the first lake they saw was striking in colour. It was a vivid milky blue with a broad band of red round its borders. The Arabs plunged into the lake and scooped up handfuls of yellow mud. It was sulphur.

There was a strong smell of hydrogen sulphide, more familiar to most people as "sulphuretted hydrogen," which is an indication of the action of sulphate reducing bacteria. The red colour of the lake was due to a carpet of gelatinous material which lay on the bed of the lake in shallow water. It was red on the top and black and green underneath.

A well washed sample was examined later at the CRL and found to consist mainly of pink cells. This is probably a species of organism which produces sulphur from the sulphide in the presence of light and deposits it *inside* the cell. The green colour was produced by other organisms which rapidly oxidise sulphide to sulphur and deposit it *outside* the cell. The bottom of the lake, it was found, was covered with a deposit of about six inches thick of finely divided sulphur.

This formation of sulphur has since been reproduced in the laboratory by inoculating an artificial lake water, based on an analysis of the original, with the red and green material and crude cultures of sulphate reducers. Much sulphur was formed.

Sulphate Reducers

Two other lakes examined were similar to the first. The fourth had the smell of hydrogen sulphide and was obviously full of sulphate reducers. It was not however producing much free sulphur and it did not have the red border characteristics of the other lakes.

An industrial process based on what takes place in the lake, may well be developed. One small lake contains about half a million gallons and produces about 100 tons of sulphur a year.

Sewage is an excellent medium for sulphate reducers and it might be possible to contaminate lakes in desert areas to facilitate large scale production of sulphur. This is, of course, a highly speculative idea, but it could be tested easily enough.

At present the samples brought back from the desert are being examined and different types of organism isolated. When pure cultures of the sulphate reducing bacteria and of the sulphide oxidising organisms are obtained it will be possible to examine their properties and to make experiments on the production of sulphur in various conditions, in different media and to use solid surfaces such as asbestos and coke to see what effect they have on speeding up the process. It may also be possible to develop artificially highly active strains of bacteria.

Metallurgical Section

2 September 1950

COBALT AND NICKEL-PHOSPHORUS ALLOYS

High Phosphorus Content Confers Commercial Advantages

A COMMERCIALLY feasible method for producing electrodeposits of cobalt or nickel alloyed with as much as 15 per cent of phosphorus has recently been developed by Abner Brenner, Dwight E. Couch, and Eugenia K. Williams of the U.S. National Bureau of Standards. The new phosphorus alloys are more easily deposited than chromium and are very hard, corrosion-resistant, and bright. They should thus be of value for many of the applications in which chromium plate is now used to obtain a hard, wear-resistant surface or a decorative finish.

Bath Conditions

Plating baths for depositing the phosphorus alloys are simply prepared, consisting of common nickel or cobalt salts, such as the sulphate or chloride, to which is added phosphoric acid as a source of phosphorus in the deposit. The baths are operated at a low pH—between 0.5 and 1.5 depending on the composition. To maintain the desired acidity in the cathode film, the solution must be buffered. The bureau has found phosphoric acid to be one of the best chemicals for this purpose.

The plating baths are kept at 75° C. or above because at room temperature the cathode current efficiency is very low and the deposits are weak. Current densities should be between 5 and 40 amp. per square decimeter. At the usual current density—about 10 amp. per square decimeter—the rate of deposition is fairly high, amounting to a few thousandths of an inch per hour.

The appearance of the deposits depends upon their phosphorus content. Alloys with less than 2 per cent of phosphorus are usually smooth with a matt finish; but as the percentage of phosphorus increases, they become brighter, reaching a peak of brightness at a phosphorus content of about 10 per cent. When such deposits are plated on a dull surface, they increase in brightness as they become thicker. As a result of the slightly dark cast of the high-phosphorus alloys, their reflectivity is 45 to 50 per cent, compared with about 60 per cent for buffed nickel coatings.

When some of the phosphorus alloys are immersed momentarily in a solution of an oxidising agent such as ferric chloride, or made the anodes in the plating bath, a jet black film is formed on the surface of the metal. This film is hard and adherent and appears to have possibilities for decorative use.

Photomicrographs of the low-phosphorus alloys show a columnar structure while the high-phosphorus alloys are found to have a laminated or banded structure. X-ray diffraction pattern of the high-phosphorus alloys shows no crystalline structure. When heat-treated, the deposits develop a fine-grained structure instead of the large crystals characteristic of pure nickel or cobalt.

Heightened Acid Resistance

The hardness of the deposits as plated varies from 50 to 720 on the Vickers scale, and increases with phosphorus content. When the alloys are heat-treated at 400° C., they become much harder. For example, a heat-treated cobalt-phosphorus deposit containing about 10 per cent of phosphorus reaches a hardness of over 1100 Vickers, which is greater than that of electro-deposited chromium.

Deposits which have been raised to 800° C. and cooled are not appreciably softer than the initial deposit. However, the alloys have poor " hot hardness " and above a temperature of 600° C. are softer than unalloyed nickel or cobalt.

Although the low-phosphorus alloys become ductile after heat treatment at 800° C., deposits containing more than 1 per cent of phosphorus are generally brittle. Alloys with higher percentages of phosphorus are highly resistant to corrosion and chemical attack, exceeding in this respect the pure metals. Thus, in experiments at the bureau the nickel alloy with 10 to 14 per cent of phosphorus

was attacked considerably less by hydrochloric acid than was pure nickel.

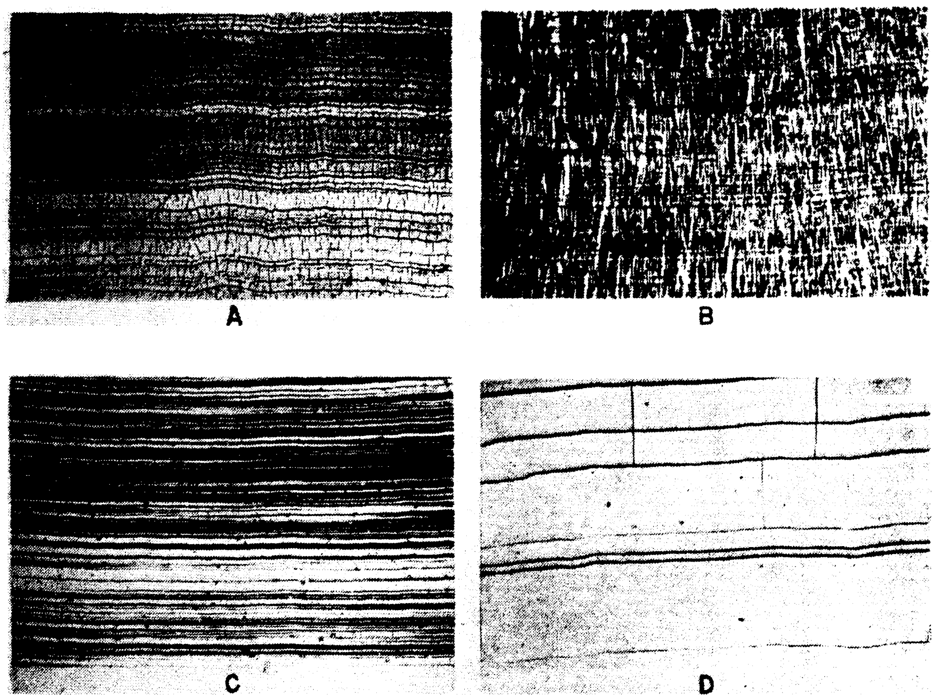
The pleasing appearance, ease of deposition, hardness, and corrosion resistance of the new alloys suggest the possibility of a number of commercial applications. Their use is indicated for gauges, cylinder walls, piston rings, and other machine parts where resistance to wear is an important factor. In this connection, the more rapid rate of deposition as compared with chromium and the better throwing power of the plating bath should be of considerable advantage.

Although the phosphorus alloys are not as white as bright nickel, the operation of the baths is much less critical than for proprietary bright nickel. The phosphorus alloys can be plated from a bath made up entirely of inorganic chemicals whereas bright-nickel plating solutions must contain an organic brightening agent.

COMPOSITION OF TYPICAL PLATING BATH FOR DEPOSITING ALLOYS OF PHOSPHORUS WITH COBALT OR NICKEL

Type of Bath*	$NiSO_4.6H_2O$ (g/l)	$NiCl_2.6H_2O$ (g/l)	H_3PO_4 (100%) (g/l)	H_3PO_3 (100%) (g/l)	$CoCl_2.6H_2O$ (g/l)
Low-phosphorus nickel ...	175	50	50	1.3	—
High-phosphorus nickel† ...	150	45	50	40	—
Low-phosphorus cobalt	—	—	50	1.3	210
High-phosphorus cobalt† ...	—	—	50	40	180

* It is important that the pH of the bath should be less than 1.0.
† The pH of the high-phosphorus bath should be raised to a value between 0.5 and 1.0 by adding nickel or cobalt carbonate



Photomicrographs of electrodeposited alloys of phosphorus with cobalt and nickel, showing the distinguishing characteristics. Phosphorus alloys show columnar structure; high-phosphorus alloys have a laminated structure. A low-phosphorus nickel (2.3 *per cent P*)*; B. Low-phosphorus cobalt* (2.2 *per cent P*)*; C. High-phosphorus nickel* (18 *per cent P*)*; D. High-phosphorus cobalt* (10 *per cent*)*. Magnification* × 275

CHOICE OF ALUMINIUM ALLOYS

Procedures to be Adopted in Testing

ALTHOUGH a very wide variety of alloys has in the past been used for the manufacture of aluminium castings, the recent tendency has been to reduce the number in current use, and, indeed, the bulk of present-day foundry production is effected using less than half a dozen different materials. The correct choice of alloy to be used in any given case depends on an appreciation of the various requirements imposed by the conditions of service, and these demands are, of course, not always compatible.

Probably the most important properties governing the selection of a suitable alloy are the mechanical properties and corrosion resistance required, while the behaviour of the alloys in the foundry must also be taken into account.

Designers should co-operate with the foundryman in making decisions about the material to be used, and if there is any possibility that large quantities, justifying the use of gravity or pressure die-casting, will eventually be required, prototype castings should be designed in such a manner as to facilitate this change.

The factors which influence the choice of a casting alloy for any given application include the following, which may be regarded as being the most important:

Strength and ductility requirements.

Foundry characteristics, including fluidity and freedom from cracking under the influence of solidification stresses.

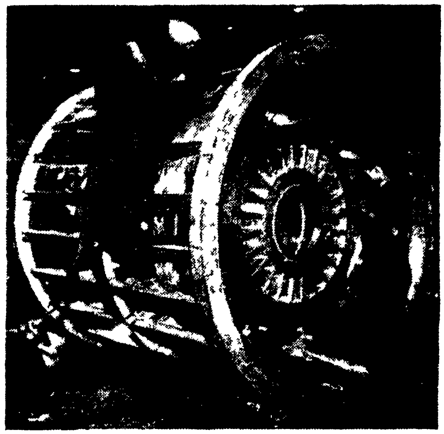
Resistance to attack by specific chemicals.

Evaluation of Properties

The properties of other than the tensile values so far discussed—resistance to hot-tearing, the reduction of strength due to porosity, and leakage under pressure—relate to the behaviour of the alloys during solidification. Full consideration must also be given to such properties as corrosion resistance and ease of machining.

Most aluminium-alloy castings are put into service without any protective surface treatment such as painting, anodising or electroplating; but in some applications such as finishes are necessary, and this may be a further factor influencing choice of alloy.

The choice of the casting process to be used depends to a considerable extent on the numbers required, die-casting (either gravity or pressure) becoming economic when runs of the order of thousands off are called for. Some limitation on alloy choice is, however, set by the nature of the process used, for while all foundry alloys may be satisfactorily cast in sand, fewer are suitable for gravity die-casting and fewer still for pressure die-casting.



[By courtesy of the Birmingham Aluminium Casting Co., Ltd.

Rotary vacuum filter drum, in course of manufacture, cast in aluminium alloy LM-4 constituting one of the largest aluminium sand castings ever produced in this country. Overall dimensions are 7 ft. 8 in. diameter by 6 ft. 10½ in., and the finished weight is approximately 3 tons. This necessitated the pouring of some 6 tons of metal and the use of 51½ tons of sand for the moulds and cores

Aluminium casting alloys fall into two principal divisions, according to whether or not they respond to heat-treatment. Those which are put into service without heat-treatment normally give tensile strengths of the order of 9 to 11 tons/in.^{2} in sand castings, with somewhat higher figures for gravity and pressure die-castings.

Fully heat-treated alloys, on the other hand, show a much higher tensile strength, values of 18 tons/in.^{2} being reached with certain alloys for sand castings and 20 tons/in.^{2} or more for gravity die-castings.

* This article is an abstract from "Aluminium Alloy Castings" published by the Aluminium Development Association, 33 Grosvenor Street, London, W.1.

The high strengths just given are developed by a double heat-treatment, consisting of solution treatment at above 400° C. followed by quenching and precipitation treatment at about 170° C. Certain alloys, such as LM7—P, receive the latter treatment only.

There is naturally a preference on grounds of cost and convenience for the alloys which do not require heat-treatment. For most general engineering applications the mechanical properties of the non-heat-treatable alloys are adequate.

It should be realised that the values given for the tensile properties specified in B.S. 1490 may not always be reached in every part of a casting; they are actually determined on test bars which solidify under conditions giving the maximum possible soundness. In practical castings used for engineering purposes lower values are unavoidable in certain regions, principally where the section is thicker than in the surrounding parts.

Solidification Shrinkage

This reduction of strength is due essentially to the contraction which molten aluminium, in common with other metals, undergoes on passing from the liquid to the solid state. As a result, porosity due to uncompensated solidification shrinkage is liable to occur in the parts which freeze last, i.e., those of heavier section. Much can be done to minimise this loss of strength by placing suitable feeders or risers at such points or by hastening their solidification by the use of chills.

Where design includes thin sections, and particularly if their area is extensive, some difficulty may be experienced in completely filling the mould. Using test castings of special form in which the alloy is allowed to run into a long, thin channel, it has been possible to grade the alloys in order of their fluidity or mould-filling properties.

Broadly speaking, the conclusion is that there is little difference between the various alloys at equal temperature intervals above the temperature at which they begin to solidify (the liquidus). The eutectic aluminium-silicon alloys have a lower liquidus temperature than solid-solution alloys containing copper, magnesium, etc., and at a fixed pouring temperature they are therefore the most fluid; accordingly they are much used in producing castings with extensive areas of thin section.

The reduction in strength in heavy sections is one aspect of a series of qualities referred to as the casting characteristics of the alloys. In certain materials cracks may be formed if free contraction is restrained by the prior solidification of parts of complex castings, and particularly where cores are used.

Experimental work and the experience of founders now make it possible to classify the alloys in relation to this defect. At this point, however, it may be emphasised that the aluminium-silicon alloys such as LM6 and LM9 and the aluminium-silicon-copper alloy LM4 are the least susceptible to the trouble.

Many castings are required to withstand liquids or gases under pressure, and in such cases any form of leakage is inadmissible. Careful attention to design will help to avoid such leakage, but it should be recognised that the several casting alloys differ considerably in this respect. In some cases, and notably where there is a more or less extended freezing range, the porosity caused by solidification shrinkage forms an interconnecting network through which gases and liquids can percolate.

There are other alloys in which the porosity takes the form of small rounded cavities isolated from each other, and in this type of material—typified by the aluminium - silicon eutectics, including LM6 and 9—a moderate amount of porosity may be tolerated, since it does not lead to leakage under pressure.

Compared with most other metals, aluminium alloys have a high durability owing to the natural oxide film present on their surface; there are, however, differences as between the different foundry alloys, and it should be emphasised that alloys not conforming to recognised standards of composition cannot be relied upon. The binary aluminium-silicon alloys have corrosion resistence in marked degree, while the presence of copper reduces this property.

In the manufacture of cast cooking utensils the material used is often an aluminium-5 per cent silicon alloy. Aluminium-magnesium alloys such as LM5 and 10 are also very suitable for applications in which marked corrosion resistance is required. This is particularly true where chloride attack is involved, as in marine service.

Anodising

Added protection against corrosion is sometimes afforded by thickening the natural oxide film by anodising, an electrical process in which the work is made the anode in a solution, generally of sulphuric or chromic acid. A somewhat similar effect to that produced by anodising may also be achieved by chemical treatments in which the work is immersed in solutions of alkali-metal salts (such as chromates and carbonates) without the application of electricity.

Anodising tends to emphasise surface

irregularities, and, on pressure die-castings, may even reveal flow lines which have been masked by polishing. The best anodised effects are obtained on gravity die-castings of suitable composition. Alloy composition has considerable bearing: for example, the high-silicon grades tend to give somewhat dark finishes, while the aluminium-magnesium LM5, aluminium-silicon-copper alloy LM4, and the complex alloy LM7 give a lighter and more uniform surface appearance.

Electroplating requires a clear and uniform surface, and gravity die-castings are the most suitable. Freedom from internal porosity is also an important requirement of castings that may be heated in service. Alloy composition does not limit the choice of metals that can be plated on to aluminium, but does affect the type of pretreatment.

For both anodising and plating, sand castings are the least suitable.

The rise of the aluminium foundry industry owes much to the requirements of aircraft constructors, and their exacting standards of quality have necessitated searching inspection procedures. For this reason aluminium-alloy founders have built up inspection departments unsurpassed by any other section of the foundry industry, and the possession of such facilities, coupled with the skill and experience gained during many years, is an asset of great value to users.

Test bars for tensile testing are often cast from each melt poured in the foundry. In aluminium-alloy practice the DTD-type bar is used, and this, in common with other test bars, is designed so as to give maximum soundness. The tensile properties found in the test bar are an indication of the quality of the metal poured and of the success of any heat-treatment applied rather than of the strength of the castings themselves.

Check by X-ray

X-ray examination is widely practised to detect unsoundness and inclusions. The proportion of castings thus inspected varies with the importance of their service function, and the method is often used in developing techniques for new designs of casting. X-ray examination is supplemented from time to time by sectioning the regions of suspected unsoundness. The use of X-rays, in addition to being a valuable check during production, is often of great value at an earlier stage establishing the most effective casting technique for a given design.

The methods of fluorescent crack detection are applied to ensure the absence of superficial cracks and unsoundness. The casting is immersed in a bath of fluorescent liquid, washed in carbon tetrachloride and then examined in ultra-violet light. Unsound or cracked areas then appear bright green against a dark background.

The French chalk test is similar to the fluorescent crack detection test in purpose but requires less-specialised apparatus. The castings to be tested are immersed for 15-30 minutes in a bath of oil held at about 90° C. They are then removed, and excess oil is removed from the surfaces, which are then dusted with fresh chalk. On cooling, surface unsoundness and cracking are revealed by the exudation of the oil, which darkens the chalk locally.

In many foundries provision is made for crushing sample castings to destruction so as to reveal any areas of weakness. This type of test is of great value during the development stages of a new design and as an occasional check during production.

Highly stressed castings are sometimes subjected to tests in which loads are applied to simulate as far as possible the actual conditions of service, the deflections at selected points being measured under the applied loads. In certain factories and testing departments there are facilities for making fatigue tests on complete castings.

Castings required to resist pressure, whether of liquids or gases, are tested for freedom from leakage. Such testing is normally carried out using compressed air or nitrogen at a pressure of 30-50 p.s.i. Leakage is revealed by immersing the castings under pressure in oil or water.

Water for Atomic Station

The Rivers Dee and Clwyd Catchments Board has approved a draft agreement allowing the West Cheshire Water Board to take from the Dee at Chester water not exceeding five million gallons a day for use at the atomic research station at Capenhurst, Wirral.

Trade Journal Publishing

Printing and Paper Frustrations

"THE outstanding event of the year was the ending of paper rationing for periodicals. Thus, during the period we are met to discuss, healthy competition returned. To the planners, that was doubtless regarded as a retrograde move—a reversion to what they would call the law of the jungle," said Mr. E. Glanvill Benn, chairman, at the recent 54th annual general meeting of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE and associated journals. "To my mind, however, the familiar cliché, 'the law of the jungle,' is entirely false and misleading as applied to modern competitive business. The boxing ring provides a more accurate analogy."

Restricting Rules

On all sides the business classes were restricted by rules and regulations at least as severe as the Marquess of Queensberry's, and in place of a referee and judges there were auditors, trade union officials and Government inspectors to watch every move, and every move was made in broad daylight, said the chairman. The winner in the boxing ring usually earned applause and a cup. The winner in the trade ring was often reviled by those who should be most grateful to him and the larger part of any silver he might earn was taken away from him.

The analogy must not be pressed too hard, but it was certainly closer to reality than the fanciful notion of a brutish tiger of a capitalist creeping silently through the dark jungle and pouncing on terrified innocents, or tearing at a more robust rival, tooth and claw, until one of them bled to death.

Like the boxer, the business man in a competitive world must keep himself trained and fit. The return to competitive conditions in the trade Press field found the company's journals in excellent trim. After nine months in the free ring their trainers reported with confidence that each journal was relatively stronger than ever. That strength was the testimony, if any were needed, to recognition in the great industries and trades the company's journals served, of the importance and value of an independent trade Press that was vigorous and free and untrammelled by the conditions and restrictions imposed by subsidies and controls on "kept" journals.

As for prospects in the coming year, the outlook was somewhat clouded at the moment by the prolongation of the ban on overtime imposed by the London Society of Compositors, with all its damaging consequences for trade and other periodicals. It was sad to reflect that barely had paper, the raw material of the publishing industry, been freed from rationing and control before another frustration made itself felt, and that through harsh action by a body of men in the printing industry, which had so often been held up as an exemplar in the matter of harmony in industrial relations. The overtime ban had already been in operation for 14 weeks.

The profit-earning powers of the business remained healthy. Revenues were higher than ever, but operating expenses, particularly costs of printing and paper, rose steeply, leaving a smaller margin of profit than a year ago.

Reserves

It would be misleading, however, to appear pessimistic. The year's profit once again enabled the directors to make large additions to the company's massive accumulated reserves and to pay the same rates of dividend as before.

The visible reserves now exceeded the paid-up capital by more than £80,000. Goodwill and copyrights stood at the nominal written-down value of £100,000. That was the same figure as two years ago, in spite of the important additions made to the company's long list of publications in that time. In other words, the company paid for those additions out of current profits, or reserves previously earmarked for just that purpose.

OCCA Exhibition

THE presentation of technical advances in those industries which supply paint, varnish, printing ink, linoleum and other related manufactures will be the theme of the third technical trade exhibition to be staged by the London section of the Oil and Colour Chemists' Association, on March 19, 20 and 21, 1951, at the Borough Polytechnic, London. It is intended to extend invitations to the exhibition, not only to all OCCA members, but as far as possible to all consuming firms in Britain and many overseas countries.

OVERSEAS CHEMISTRY AND INDUSTRY

INDIA'S CONTINUED EXPANSION

Some Further Self-Sufficiency Pointers

FURTHER references to India's aim to be self-sufficient in salt and a number of other products were made recently in the New Delhi Parliament by Mr. H. K. Mahatab, minister of industry and supply. For example, he said the manufacture of salt as a cottage industry has considerably developed in Orissa. About 1 million maunds of salt, calculated to be about half the requirements of the State were now coming from this source. The newly formed salt manufacturers' association is urging the Government to continue to restrict salt imports in the interests of the home producers.

India will export about 700,000 tons of manganese ore during 1950, of which the largest importer will be the U.S.A.—500,000 tons. India's export last year was approximately 500,000 tons.

Mr. K. M. Munshi, India's Food Minister, in a written reply in the Union Parliament, New Delhi, said that a total quantity of 872,678 tons of fertilisers, valued at Rs. 111,946,065 was imported in the seven months ending July 31, 1950, into India.

Mr. H. K. Mahatab said that the Sindri fertiliser factory was likely to go into full production about August next year.

The Indian Tariff Board holds that there is no case for protection of the liver extract industry in India, the fair prices of the indigenous products being appreciably below the landed cost of comparable imports. The Government of India has accepted the Board's recommendation.

Imports

The Board further stated that licences for imports of vitamins for liver extract compounds should be liberally granted.

The Government of India has also put on open general licence a number of articles required for indigenous purposes and certain types of essential consumer goods including textile chemicals, mercury and tallow.

Oil has been struck in the Patharia reserve forest area in Cachar district on the East Bengal-Assam border. A production of about 500,000 tons of oil is expected in the next two years.

The Central Glass and Ceramic Research Institute of India, at Jadavpur, the fourth in the chain of 11 national laboratories, was opened on August 19.

Plastic manufacturers in India have now taken up the manufacture of artificial plastic eyes from acrylic plastic and it is stated that the annual demand of the Ministry for about 150 eyes can be met by indigenous production.

Production of plastics goods in India has risen from 870,000 lb. in 1948 to 1,048,000 lb. in 1949. There are today about 200 compression moulding presses, 120 injection moulding machines and 40 extruders installed in India.

Bauxite Scheme in Jamaica

CONSTRUCTION of plant having a production capacity of about 40,000 tons of aluminium oxide (semi-processed bauxite) annually is being planned by Jamaica Bauxites, a wholly-owned subsidiary of Aluminium, Ltd., of Canada.

Funds will be advanced by the Economic Co-operation Administration (Marshall Plan) amounting to $2.5 million and $1.5 million. This is the second contract signed by the ECA for the mining of bauxite in the British West Indies.

Ordering of equipment and detailed engineering planning for the project will begin at once and a large proportion of equipment will be ordered from U.K. sources. The scheme is expected to be completed by the end of 1953.

This enterprise had been under consideration since 1942 just after the discovery of bauxite in Jamaica, said Mr. Nathanael V. Davis, president of Aluminium, Ltd. Some $3.4 million (Canadian) had been invested in acquiring about 80,000 acres of land in the island, and in research and development.

After a study of the special nature of Jamaican ores and the economics of their ocean transportation, it had been decided not only to undertake bauxite mining, but also extraction of aluminium oxide, through the construction of a plant capable of producing 100 tons of oxide a day.

When the initial stage of the oxide plant is completed, total investments of Aluminium, Ltd., in Jamaica, will amount to about £12 m., including agricultural operations.

The Chemist's Bookshelf

THE CHEMISTRY OF THE ACETYLENE COMPOUNDS. Vol. 2, The Acetylene Acids. A. W. Johnson. 1950. Edward Arnold & Co. Pp. 828. 50s.

This is the second volume by Dr. Johnson on the chemistry of acetylenic compounds; the first, which was published in 1946, dealt with the acetylenic alcohols.

The book is divided into four parts, of which the two largest are devoted to the acetylenic monocarboxylic acids and the acetylenic polycarboxylic acids. The two remaining parts deal with the polyacetylenic carboxylic acids and the acetylenic non-carboxylic acids respectively. The author has followed his previous practice of organising his subject matter and the three main parts of the book are subdivided as follows: historical, natural occurrence, nomenclature, methods of formation, physical properties, reactions involving the carboxyl group, reactions involving the triple bonds, reactions involving the free ethinyl group and, finally, reactions involving the whole molecule.

The main text covers the entire literature up to the end of 1948 and there are upwards of 1500 references. Two appendices are included. One of these deals with the available literature published during 1949 and thus brings the book as up to date as possible under the present somewhat adverse publishing conditions. The other appendix is a table of the chief physical constants of the known acetylenic acids, together with literature references as to the best methods of prepartion, and listed according to the system of Richter's "Lexikon der Kohlenstoff-Verbindungen."

As the author observes in his preface, "the acetylenic acids . . . are of considerable importance in synthetic organic chemistry" and for chemists engaged on such work this book is a most valuable addition to their literature. Dr. Johnson appears to have made every endeavour to ensure accuracy and there is reason to believe that his book will prove to be a standard work on the subject. Despite the considerable advances still being made in the chemistry of the acetylenic acids, it seems reasonable to expect that this volume should not become out of date for a long time to come. One might perhaps have expected a rather more critical presentation, although in this respect the author may have found himself limited for space, and have cut his matter accordingly.

Altogether, a splendid book.—P.M.

AN OUTLINE OF SCIENTIFIC CRIMINOLOGY. Nigel Moorland. 1950, London. Cassell & Co., Ltd. Pp. 284. 12s. 6d.

Few except specialists—and they are not numerous in this field—have the leisure to consider the little known branch of science concerned with the detection of crime and criminals. Here is a very knowledgeable and comprehensive survey of all the numerous forms of applied science now being used in establishing facts before the law, of which occasional glimpses are given in the published reports of trials. Here the multiplicity of techniques, ranging from anatomy and medicine to metallography and ballistics, microscopy, photography, and forensic chemistry which police departments can call upon are given much fuller treatment. This with the many actual examples cited makes a narrative very much more compelling than the average "thriller." The author does not disguise his discontent that both France—in this regard a pioneer—and the U.S.A. have left this country far behind in the creation and use of forensic science departments. His whole narrative, however, proves beyond doubt how successful have been the improvisations here, because of a readiness of experts in all branches of science to make all their skill and knowledge available whenever the ends of justice require them.

Books Received

QUANTITATIVE MICROANALYSIS. P. L. Kirk. 1950, New York: John Wiley & Sons, Inc. London: Chapman & Hall. Pp. vii + 310. $5.00.

FRICTIONAL PHENOMENA. Andrew Gemant 1950 Chemical Publishing Co., Inc. New York. Pp.xi + 497. $12.00.

Technical News and Services

PUMPING 20 tons of molten zinc between buildings 50 ft. apart—a job which, done by hand, would have taken eight men a whole day—was completed in 20 minutes by means of an electrically driven centrifugal pump, designed by Mr. Paul M. R. Bower, a director of Barnards, Ltd., wire netting manufacturers, Norwich. The firm says this is probably the first time such an operation with molten zinc has been carried out successfully in this country. This is one of the productivity items recorded in the current issue of *Target*, issued monthly by the Economic Information Unit of the Central Office of Information.

* * *

LEATHER in Germany during the war is the subject of a BIOS survey, number 27, which has just been published. It contains over 100 reports which cover many aspects of leather processing and manufacture. Two new tannages evolved during the war are described—the sulphonyl chloride and the di-isocyanate methods. The arrangement of the survey is encyclopædic and there is a comprehensive index of subject matter, together with a list of the tanneries and chemical plants visited by the investigators. The survey is called "The Leather Manufacturers and Related Industries in Germany during the period 1939-1945."

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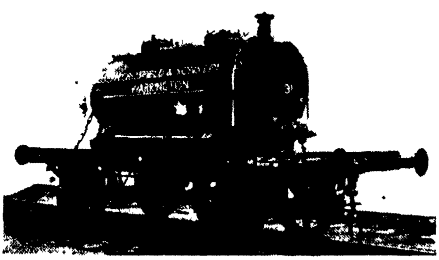
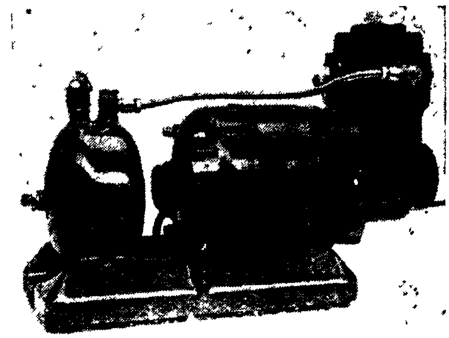
THE development of the pipeline method of transporting crude petroleum and the construction and operation of a modern pipeline are reviewed in an illustrated article in the August issue of the *Edgar Allen News*.



One of 12 special demountable tanks, recently completed for British Railways, to convey sodium silicate. Each is of 875 gal. capacity. They have a working pressure of 40 p.s.i. and are provided with a heating coil tested to withstand a pressure of 150 p.s.i.



[By courtesy of the Hymatic Engineering Co., Ltd.

A new design of diaphragm type compressor to provide air completely free from oil and other impurities. It is particularly suited for food processing, medical and industrial laboratories, raising liquids which must not be contaminated, insecticide and pest control spraying, or spray painting. The compressor crank-case and cylinder head are of aluminium alloy, the head being finned for effective cooling

ANTWERP'S new oil refinery being constructed by the Anglo-Iranian Oil Company and the Belgian group Petrofina is expected to be completed by 1951. A description of the project and an artist's coloured impression of the refinery as it will ultimately look, are given in "Naft" (August, Vol. 26, No. 4) published by the Anglo-Iranian Oil Co., Ltd. The nominal capacity of the refinery is 1.32 million tons of crude a year, and main items of process plant will be: crude distillation unit; visbreaker and thermal cracking unit; reformer; redistillation unit; cracked P.D. acid treating plant; kerosene acid batch washer and copper chloride treaters.

A NEW bonding technique for the production of steel-shafted badminton racquets is described in "Aero Research Technical Notes" (Bulletin 92, August 1950), now available from the technical service department, Aero Research, Ltd., Duxford, Cambridge. It is claimed that the process provides greater strength with less weight, while the adhesives used are unaffected by mould, fungi, moisture, and are even able to withstand the effects of boiling water without deterioration.

OVERSEAS NEWS ITEMS

Haifa Refineries Reopened

Reports from Haifa state that the oil refineries there resumed operations last Monday (August 28) for the first time since they were closed two years ago.

Arctic Steel Mill

The Government-owned company which is building a large new steel mill at Mo i Rana, North Norway, confirms that the British firm of Davy and United Engineering Co., Ltd., Sheffield, has secured a contract for supplying equipment to the mill. The contract is said to be worth more than £1 million, states the bulletin of the Royal Norwegian Information Service in London.

Swiss Chemical Exports

Official Swiss export trade returns for July show a total value for chemicals, pharmaceuticals, dyes and perfumery of Fr.44.5 million compared with Fr.40.6 million in the previous month. Pharmaceutical products again occupy the leading position with (in million Swiss francs) 20.3 (18.0), followed by dyes 16.2 (14.1). Exports of industrial chemicals declined slightly from 6.5 million in June to 5.9 in July, and perfumery remained unchanged at 2.0.

Synthetic Fibres May Oust Wool

The probability of synthetic fibres replacing wool was expressed recently by Professor T. G. Hunter, professor of chemical engineering at Sydney University in an article in the *Sydney Morning Herald*. The professor specifically referred to a synthetic called vicara made from zein, a protein extracted from corn.

Rubber Seed Oil as Insecticide

Rubber seed oil, experimentally extracted at the rubber laboratory as a base for paints, is now being tested for wider applications according to Dr. A. Sundaralingam, rubber technologist to the Ceylon Government. The Ceylon Medical Research Institute has found the oil an effective prophylactic against the common house-fly.

Austrian Laboratory Glassware

The Oesterreichische Labor-Glas, GmbH, Koeflach, Styria, has begun the manufacture of a wide range of glassware for laboratory and technical purposes, the products being, it is claimed, equal in quality to the best foreign makes. It is expected that this project will save the country large sums in foreign exchange and that it may eventually be possible to export glassware. Until quite recently Austria had been entirely dependent upon imported laboratory and other high-grade glassware.

PERSONAL

MR. R. H. COOKE, of Phillips Electrical, Ltd., has been appointed assistant manager of its X-ray department. For the past four years he has maintained close contact with universities engaged in nuclear physics research, and conducted much of the Philips Company's liaison with AERE, Harwell.

MR. R. L. FORTESCUE has been appointed senior lecturer in charge of the particle accelerator laboratory which is under construction at Queen Mary College, London. This is designed for the study of machines used in nuclear physics and radiotherapy and the principles relating to the use of nuclear energy. Since 1945 Mr. Fortescue has been working at the Atomic Energy Research Establishment, Harwell, as a principal scientific officer.

MR. PHILIP A. SINGLETON, assistant director of Monsanto Chemical Company's foreign department, St. Louis, Mo., U.S.A., is to join the British company on October 9 to assist in representing the organisation's U.K. and European interests.

J. P. FRIEND, from Massachusetts Institute of Technology, is one of two Americans at present taking a vacation course at the Dunlop Research Centre under the International Student Exchange Scheme. He is attached to the chemical research division to study the chemistry of synthetic rubbers.

Obituary

The death is announced, at the age of 63, of MR. ARTHUR JAMES GILLIAN, general secretary of the Chemical Workers' Union for more than 20 years until 1947.

New U.S. Chromium Process

A NEW process will be utilised in an electrolytic chromium plant to be constructed at Sault Ste. Marie, Michigan, by the Electro Metallurgical Division of the Union Carbide & Carbon Corporation, New York. The plant is expected to be in operation by the spring of next year, and will adjoin the company's present facilities used for the production of calcium carbide. The metal produced by the process is claimed to be of a higher degree of purity than any commercially produced chromium metal at present available.

HOME

New Iron and Steel Order

The maximum prices of a limited range of iron and steel products have been amended by an order which came into force last Tuesday (August 29). The principal alterations are increases in the maximum prices of electrical sheets, wire and wire products.

Microscope Linked with Television

A method of combining a microscope with a television camera was demonstrated last week to members of the International Institute of Haematology attending their annual conference at Cambridge. Slides of blood samples were reproduced, greatly enlarged, in full colour on a series of television screens.

OCCA Post Graduate Lectures

Post graduate lectures of the Oil and Colour Chemists' Association have normally been held in London, but this year the tenth series is being organised by the Manchester section and will take place at Cheetham Town Hall on Fridays September 29, October 6 and 13 at 6.30 p.m. The subject is "Topics in Colloid Science," and the lecturer A. S. C. Lawrence, Sc.D., Ph.D., F.R.I.C.

Midlands Gas Price Increases

Increases in the price of gas in most parts of Warwickshire, Worcestershire, Staffordshire, Herefordshire and Shropshire are announced. The increased charges vary between ¾d. a therm, for most districts where gas is sold on a thermal basis, and 3d. per 1000 cu. ft. for most areas where it is sold by volume. The increases are stated to be due to higher transport charges and wages, and a rise in the cost of gas oil.

Education in the Electroplating Industry

A special joint meeting of the Electrodepositors' Technical Society and the Metal Finishing Association will be held at the James Watt Institute, Great Charles Street, Birmingham, next Tuesday. An address on "Education in the Electroplating Industry" will be given by Mr. C. Harris, chairman of the Midlands Centre. A joint discussion will follow, with special reference to implementing the new Fellowship in Electrometallurgy at Birmingham University and to framing a constructive resolution on education in the plating trade, both from the technical school and apprenticeship standpoint.

Electrodepositors Going to Holland

A joint meeting of the Electrodepositors' Technical Society with the Dutch Electroplaters' Society (*Studiekring Galvanotechnick*) will take place in Holland at The Hague (Scheveningen) and Eindhoven from Wednesday September 27 to Saturday September 30.

Control of Tin Planned

An international tin conference is being arranged to take place next month at the headquarters of the United Nations in Geneva. More than 50 countries and international organisations are expected to attend and a draft agreement, prepared by the International Tin Study Group, for control of the commodity will be studied.

High Vacuum Research

British-American Research, Ltd., which manufactures high vacuum equipment, has left its Hillington, Glasgow factory and is now located at Wishaw. It is planning an expansion of research and development work in the applications of high vacuum plant in co-operation with a number of industrial concerns interested in the field and its uses.

Uranium in North Wales

A find of relatively high radioactivity in the Dolgelley black band shales of North Wales was announced at the beginning of this week by the Department of Scientific and Industrial Research. Deposits were found by the Geological Survey and some 4000 samples have been examined and analysed. It is estimated that there may be a million tons of uranium in submarginal grade rocks carrying 80 grams a ton. The normal minimum economic grade considered worth exploitation, has up to now, been at least 150 grams.

£4 m. Steel Project

Extensions planned by Colvilles, Ltd., at its Clydebridge works, Cambuslang, are expected to be completed next month. It is intended to develop steel-making by the hot metal process using liquid iron and in conjunction with the two additional 300-ton tilting furnaces to take liquid pig iron from the nearby Clyde iron works. The total scheme estimated at over £4 million incorporates a battery of new soaking pits, stripper and slab handling bays and duplication of the 68-oven battery at Clyde iron works to ensure coke self-sufficiency.

The Stock and Chemical Markets

MARKETS were influenced earlier this week by the caution on the part of buyers reflecting conflicting views as to China's intentions in the Far East. After their recent strength, British Funds turned reactionary with 3½ per cent War Loan back to 94⅜. Nevertheless, there was little selling, but the trend in gilt-edged stocks governed other sections, and generally small declines prevailed, although the engineering and armament sections held recent gains.

In some cases, however, because of the reduced demand in evidence, moderate selling had a disproportionate effect on prices. Imperial Chemical, for instance, have fallen sharply to 41s. 10½d. at the time of writing, Monsanto were steady at 49s. 6d., Fisons were 26s. 6d. and Laporte Chemicals 5s. units 10s. 4½d. Albright & Wilson 5s. shares strengthened from 30s. 6d. to 30s. 9d. on the surprise announcement by the directors foreshadowing a share bonus of 100 per cent by the end of the year. Meanwhile, the issue of over £2 million of 5 per cent preference shares at 20s. each on the basis of one for every two 5s. ordinary held is expected to be a big success. The directors believe that profits are unlikely to be below last year's £912,735, on which basis the preference dividend would be covered seven times.

Brotherton 10s. shares have remained at 19s. 10½d., W. J. Bush were 81s. 9d., Lawes Chemical 10s. 3d., and F. W. Berk 2s. 6d. shares have strengthened to 10s. 6d. Boake Roberts 5s. shares were 29s. 9d. and Amber Chemical 2s. shares 3s. Pest Control were 6s. 9d., Bowman Chemical 4s. shares 5s. 8d., L. B. Holliday 4½ per cent preference 19s. 6d., and British Chemical & Biologicals 4 per cent preference 17s. 3d. Woolley 4¾ per cent debentures remained at 104½.

Glaxo Laboratories showed firmness at 48s. 3d., Turner & Newall were steady at 80s. 3d. on talk of higher dividend prospects, and Borax Consolidated kept at 54s. 6d. United Molasses at 42s. 9d. were little changed on balance, and the 4s units of the Distillers Co. moved up to 19s. 3d. on further consideration of the annual report, which tended to emphasise the widespread chemical and industrial interests of the group.

Associated Cement at 85s. held up quite well, British Plaster Board 5s. ordinary were 14s. 1½d., and paint shares were mostly firm, Pinchin Johnson at 40s. 3d. having remained under the influence of the chairman's statement foreshadowing segregation of the company's overseas assets. United Glass Bottle were again 75s., and Triplex Glass 10s. shares firmed up to 24s. 6d.

In iron and steels, Hadfields eased to 28s., but Dorman Long at 32s. 1½d. and United Steel at 28s. 1½d. held up well.

Boots Drug at 49s. lost an earlier rise, Griffiths Hughes were 20s. 9d. and Beechams deferred 12s. 9d. Plastics kept around last week's levels, although British Xylonite eased to 72s. 6d. British Industrial Plstics 2s. shares were 5s. 6d., De La Rue 23s. 6d. and Kleemann 7s. 7½d. Lever & Unilever again changed hands around 39s. 9d., British Match were 34s. 3d. and British Aluminium firmed up to 41s. 6d. Oils turned reactionary with the general trend of markets earlier in the week. Anglo-Iranian eased to 5 13/16, Shell were 62s. 6d. and Burmah Oil 55s.

Market Reports

THE past week has witnessed a steady demand for the general run of industrial chemicals and the renewed interest in contract business has been fairly well sustained. There has been a steady overseas inquiry and actual bookings are reported to cover good volumes. The price position remains firm with no alterations of importance on the week, and although conditions continue active the market is without feature. There is a ready outlet for most of the coal tar products and quotations are steady with a strong undertone.

MANCHESTER. — Firm price conditions obtained in most sections of the Manchester chemical market, though actual changes compared with a week ago having been few. Home trade consumers of the bread-and-butter lines are calling for steady deliveries under contracts, and a fair aggregate weight of business has been placed in the alkalis and many other heavy chemicals. Most of the potash compounds are finding a ready outlet. A fair export trade is passing and additional inquiries covering a fairly wide range has been reported during the week. Most of the tar by-products are meeting with a reasonably steady demand.

GLASGOW.—The Scottish heavy chemicals market continues to improve and orders are arriving with steady regularity. Exports have improved in volume considerably during the past week.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges The following Mortgages or Charges have been so registered In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

COMPRESSED RUBBER PRODUCTS, LTD., Harefield. (M., 2/9/50). July 24, £1600 charge, to Miss E. A. Warren, London; charged on 6 Beechcroft Avenue, Croxley Green. *—. September 3, 1947.

ELCO PLASTICS, LTD., London, E.C. (M., 2/9/50). July 27. £4000 deb., to A. S. Levinger, London; general charge. *Nil. Dec. 31, 1949.

EXPANDED ALUMINIUM PRODUCTS (READING), LTD., London, E.C. (M., 2/9/50). July 28, series of £2000 debs. present issue £1200; general charge.

GREENS FOUNDRIES (PETERBOROUGH), LTD. (formerly GREENS ALUMINIUM FOUNDRIES, LTD.). (M., 2/9/50). July 27, £600 mort., to Nottingham Building Soc.; charged on 50 Alma Road, Millfield, Peterborough. *Nil. Apr. 25, 1949.

MELWOOD THERMOPLASTICS, LTD., London, E.C. (M., 2/9/50). July 26, £10,000 debs.; general charge. *£3000. Dec. 26, 1949.

Satisfactions

W. EDMONDS & CO., LTD., London, W., chemists. (M.S., 2/9/50). Satisfaction July 29, of debs. reg. May 20, 1930, to the extent of £4000.

MERRIGLO, LTD. (formerly MERRIGLO (PLASTICS), LTD.), London, W., dealers in plastic materials, etc. (M.S., 2/9/50). Satisfaction July 31, of deb. reg. Oct. 8, 1948.

JAMES VINCE & CO., LTD., Battersea, electro platers, etc. (M.S., 2/9/50). Satisfaction July 28, of debs. reg. Aug. 21, 1930, to the extent of £1900.

Change of Name

The name of Henley Industries, Ltd., has been changed to HENLEYS MEDICAL SUPPLIES, LTD.

Increases of Capital

The following increases of capital have been announced: Deodor-X Company of England, Ltd., from £100 to £80,000; Deodor-X Hygiene Services, Ltd., from £100 to £10,000; Wm. Lindlaten & Co., Ltd., from £2000 to £6000.

New Registrations

Barrymoors, Ltd.

Private company. (485,432). Capital £1000. Manufacturers of minerals, oils, ores, metals, chemicals, etc. Directors: J. H. Davies, "Hillside," Danycoed Road, Cyncoed, Cariff; and J. L. Walters, Tudor House, Llyswen Road, Cyncoed, Cardiff. Reg. office: Barrymoors, Cadoxton, Barry, Glam.

Breaks Brothers, Ltd.

Private company. (485,435). Capital £10,000. Manufacturing, pharmaceutical, analytical and advising chemists; manufacturers of solvents, etc. Directors: J. J. Breaks, 290 Rooley Lane, Bradford; J. R. Breaks, 570 Heaton Road, Bradford; and J. Dyson, 43 Thorn Lane, Haworth Road, Bradford. Reg. office: Powell Road, Bolton Woods, Bradford.

Certofix, Ltd.

Private company. (485,266). Capital £100. Manufacturers of all kinds of chemical substances, including cements, glues, mastics, resins and other adhesives, etc. Company secretary: J. Green, 92 Hardy Street, Hull.

Dietetic Preparations, Ltd.

Private company. (485,089.) Capital £100. Cleaning and sterilising, manufacturers of vegetable and mineral drugs, alkaloids, etc. Directors: J. Webster, Carlton Mill, Clitheroe, Lancs., and J. A. Rush.

Fibre Form, Ltd.

Private company. (485,236). Capital £100. Moulders and/or turners of plastic materials of all kinds, substances and compositions, chemicals and chemical products, etc. Directors: B. Gardner and O. A. W. Budd. Reg. office: 39 New Broad Street, E.C.

Gamlen (London) Ltd.

Private company. (485,561). Capital £10,000. Manufacturers and exporters of chemicals and chemical products, etc. Subscribers (each with one share): B. S. Fisher and S. Disborough, both solicitors, of 18, Austin Friars, E.C. Reg. office: 11 Ironmongers Lane, E.C.2.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Insecticidal compositions.—Merck Co., Inc. Aug. 21 1946. 643,450.

Methods of conditioning and treating lime and product thereof.—G. & W. H. Corson, Inc., and B. L. Corson. Sept. 17 1946. 643,451.

Liming of skins and hides.—S. Payno. Jan. 15 1947. 643,452.

Methods of manufacturing mouldings of synthetic resin material suitable for high-tension insulation.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 17 1946. 643,453.

Methods for purifying town gas.—L. Fassina, and L. Fassina. Oct. 22 1946. 643,454.

Surface active ingredients.—Sharples Chemicals, Inc. Nov. 13 1946. 643,456.

Process for waterproofing materials and the waterproofed materials so produced.—F. J. Sowa. Nov. 22 1946. 643,458.

Coating compositions.—A. McDonald. Dec. 4 1946. 643,512.

Glass-to-metal seals.—British Thomson-Houston Co., Ltd., and W. J. Scott. June 11 1948. 643,323.

Catalysts.—Anglo-Iranian Oil Co., Ltd., E. W. M. Fawcett, and J. N. Haresnape. Jan. 22 1948. 643,459.

Methods of producing penicillins.—E. Lilly & Co. Jan. 15 1947. 643,514.

Printing of polyvinyl resins.—Associated Technical Maufactures, Ltd., L. W. E. Townsend, and E. C. Bate. Jan. 14 1948. 643,463.

Process for vapour phase hydrogenation of the saturated compounds.—Koppers Co., Inc. April 1 1947. 643,326.

Method of and apparatus for forwarding filamentary material.—Imperial Chemical Industries, Ltd., and A. Nield. April 14 1948. 643,516.

Aryl-substituted alkanes. — California Research Corporation. April 16 1947. 643,517.

Manufacture of proteolysed liver preparations.—Raptakos, Brett & Co., Ltd., and G. B. Ramasarma. May 20 1947. 643,331.

Manufacture of acetic acid and other oxygen-containing aliphatic compounds.—J. G. N. Drewitt. June 11 1948. 643,468.

Method for making phosphonic acids or derivatives of phosphonic acids, and products thereof.—W. W. Triggs (Oldbury Electrochemical Co.). June 19 1947. 643,334.

Calcining lime bearing sludges.—Dorr Co. July 4 1947. 643,335.

Amino-alkyl derivatives of thiophenes.—Socony-Vacuum Oil Co., Inc. July 29 1947. 643,337.

Method of manufacturing sulphurous anhydride.—J. C. Seailles. July 29 1947. 643,479.

Insecticidal compositions.—Harvel Corporation. July 30 1947. 643,480.

Automatic gas safety shut-off.—R. E. Newell. July 30 1947. 643,482.

Petroleum oils and greases made therewith.—Harvel Corporation. Aug. 7 1947. 643,489.

Physiologically active substances. — Sharp and Dohme, Inc. Aug. 7 1947. 643,382.

Heat repellant paints, cements, and the like.—G. S. Adlington. Aug. 16 1948. 643,345.

Plastic composition.—Hercules Powder Co. Aug. 27 1947. 643,348.

Manufacture of soaps.—R. J. B. Elissabide. Aug. 27 1947. 643,493.

Formation of metallic films by thermal evaporation. — Polytechnic Institute of Brooklyn. Sept. 12 1947. 643,494.

Processes for the preparation of products smelling of irone, processes for preparing 6-methyl-α-ionone and -methyl-β-ionone and products smelling of irone.—H. Firmenich, A. Firmenich, R. Firmenich, and G. Firmenich (trading as Firmenich & Co.). Sept. 19 1947. 643,353.

Manufacture of monoazo-dyestuffs.—Ciba, Ltd. Sept. 25 1947. 643,354.

Heating of containers receiving material intended to be extruded under pressure.—Soc. Anon. Des Ateliers et Chantiers de la Loire, and Compagnie Generale du Duralumin et du Cuivre. Oct. 1 1947. 643,357.

Electrostatic dust precipitation. — Westinghouse Electric International Co. Oct. 14 1947. 643,363.

Concentration of the carotenoid content of a fatty oil.—M. W. Kellogg Co. Oct. 16 1947. 643,365.

Horticultural compositions. — B. F. Goodrich Co. Oct. 17 1947. 643,519.

Thermal treatment of steel and products thereof.—Uddeholms Aktiebolag, and A. G. Molinder. Nov. 30 1948. 643,367.

Process for the production of oxygen-containing hydrocarbon derivatives.—J. G. Fife. (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). Nov. 3 1947. 643,508.

Process for making valuable products out of metallurgical slags.—J. C. Seailles. Nov. 5 1946. 643,849.

Methods of separating mixed fatty acids. —Emery Industries, Inc. Nov. 28 1946. 643,851.

Production of soap.—J. K. O. H. Holmberg. Dec. 11 1946. 643,852.

Medicinal capsules and process of manufacture.—E. Lilly & Co. Jan. 8 1947. 643,853.

Method and apparatus for moulding articles from plastic materials.—Gora-Lee Corporation. Jan. 9 1947. 643,855.

Process for preshrinking fabrics.—F. R. Redman. Feb. 19 1947. 643,714.

Refining of silver alloys.—B. K. Bose and G. C. Mitter. May 27 1947. 643,667.

Recovery of metals from base metal nitrates.—B. K. Bose and G. C. Mitter. June 4 1947. 643,668.

Collagen strands and the manufacture thereof.—American Cyanamid Co. April 10 1947. 643,859.

Impregnated paper.—Plywoods-Plastics Corporation. April 24 1947. 643,782.

Insecticides.—Mathieson Alkali Works. May 19 1947. 643,676.

Methods of oxidation of hydrocarbons and the products resulting therefrom.—Clark Bros. Co., Inc. May 29 1947. 643,862.

Sprayed metal protective coatings for metal or other base members.—Westinghouse Electric International Co. June 6 1947. 643,678.

Coating and decorating compositions.—Interchemical Corporation. July 16 1947. 643,724.

Ammonium nitrate blasting cartridges. —Atlas Powder Co. July 21 1947. 643,871.

Ammonium nitrate-containing blasting cartridges.—Atlas Powder Co. July 21 1947. 643,872.

Production of hydroxy benzene resins and product thereof.—Koppers Co., Inc. Aug. 6 1947. 643,730.

Surface treatment of magnesium alloys. —A. Abbey (Dow Chemical Co.). Aug. 15 1947. 643,877.

Production of acid chlorides of aromatic polybasic acids.—Wingfoot Corporation. Aug. 27 1947. 643,788.

Process and means for carrying out heat-exchange.—Union des Verreries Mecaniques Belges Soc. Anon. Sept. 23 1947. 643,881.

Preparation of catalysts containing mercury and their use in the preparation of vinyl halides.—Gevaert Photo-Producten N. V. Oct. 1 1947. 643,748.

Cooling processes and machines.—Petrocarbon Ltd., and M. Ruhemann. Oct. 15 1948. 643,886.

Container for penicillin or other viscous injectable substances.—A. M. Bickford & Sons, Ltd. Oct. 30 1947. 643,887.

Dyestuffs and pigments derived from thiazoyl-2 thioglycollic acids.—Ilford, Ltd., G. F. Duffin and J. D. Kendall. Nov. 9 1948. 643,681.

Method of and apparatus for continuous extraction from solid materials.—Prvni Brnenska A. Kralovopolska Strojirna Gottwaldovy Zavody, Narodni Podnik. Nov. 19 1947. 643,893.

Thermosetting moulding compositions.—British Industrial Plastics, Ltd. Nov. 20 1947. 643,750.

Clear, smooth-surfaced bubble-free castings of a polymerised vinylidene compound and method of producing same. Nov. 24 1947. 643,752.

Heat-exchange devices.—Imperial Chemical Industries, Ltd., and A. G. Butt. Dec. 10 1948. 643,683.

Granulation of super-phosphatic fertilisers.—Sturtevant Engineering Co., Ltd., H. Richardson & Co. (York), Ltd., J. T. Procter and A. Ogilvie. Oct. 15 1948. 643,762.

Devices for mixing disinfectant or other liquids with water.—Non-Drip Measure Co., Ltd., and W. R. Berwick. Feb. 9 1949. 643,763.

Emulsions of saturated fatty acids.—Nopco Chemical Co. Jan. 20 1948. 643,765.

Production of propylene oxide.—Linde Air Products, Co. Jan. 24 1948. 643,687.

Reaction of organic mercaptans with formaldehyde and ammonia.—Monsanto Chemical Co. Jan. 27 1948. 643,688.

Metallurgical apparatus.—Birlec, Ltd. Feb. 28 1948. 643,800.

Process of softening water and a filter for carrying out the said process.—C. H. V. Pape. March 5 1948. 643,805.

Low temperature carbonisation of carbonaceous materials.—M. Steinschlager. March 3 1949. 643,916.

Process of preparing a vitamin preparation and the product resulting therefrom. —E. Lilly & Co. March 23 1948. 643,690.

Feed heating and feed distribution in water tube boilers.—La Mont International Association, Ltd., and F. W. Bower. March 31 1948. 643,813.

Electric insulators having semi-conducting glazes.—Bullers, Ltd., and G. Perrins. May 5 1949. 643,814.

Welding of seams in metallic tubing and between metallic parts.—General Electric Co., Ltd., W. F. Baker, and J. R. Spencer. April 1 1949. 643,816.

Process for coating surfaces.—Schori Metallising Process, Ltd., and P. G. Clements. March 16 1949. 643,691.

Electrodeposition of tin.—W. W. Triggs (Carnegie-Illinois Steel Corporation). May 12 1948. 643,928.

Apparatus for washing suspended matter from air.—Peters-Dalton, Inc. Nov. 5 1947. 643,504.

Diazotype photographic material.—General Aniline & Film Corporation. Dec. 1 1947. 643,375.

Process for the preparation of artificial cryolite substantially free from silica.—Montecatini Soc. Generale Per L'Industria Mineraria e Chimica. Dec. 10 1947. 643,510.

Process for the preparation of aluminium fluoride from fluosilicic acid.—Montecatini Soc. Generale Per L'Industria Mineraria e Chimica. Dec. 15 1947. 643,379.

Production of polymeric materials.—Gas Light & Coke Co., R. H. Griffith, and J. H. G. Plant. Dec. 16 1948. 643,388.

Process and apparatus for the production of polymeric materials.—Soc. Belge de L'Azote et des Produits Chimiques du Marly. Dec. 30 1947. 643,527.

High-efficiency combustion of solid fuel.—Spladis Soc. Pour L'Application D'Inventions Scientifiques. Dec. 31 1947. 643,393.

Apparatus and a process for the manufacture of sulphuric acid.—P. Guareschi, G. Maragliano-Busseti, and L. Pettenati. Dec. 31 1947. 643,394.

Process for the recovery of pectic products from vegetable matter.—A.S.P. Chemical Co., Ltd., C. L. Walsh, B. A. Adams, and J. P. Cook. Dec. 13 1948. 643,533.

Apparatus for identifying colour.—D. W. Thomasson. Dec. 29 1948. 643,396.

Process for coating metal objects by electrophoresis.—Soc. Anon. de Commentry Four-Chambault & Decazeville. Jan. 7 1948. 643,534.

Manufacture of tetrakisazo-dyestuffs.—Ciba, Ltd. Jan. 8 1948. 643,535.

Lubricating compositions.—Standard Oil Development Co. Jan. 9 1948. 643,536.

Method of forming coated surfaces.—Schori Metallising Process, Ltd., and P. G. Clements. Jan. 31 1949. 643,539.

Production of blown fatty materials.—Nopco Chemical Co. Feb. 12 1948. 643,403.

Agglutinogen derived from whooping cough organisms.—E. W. Flosdorf. Feb. 24 1948. 643,546.

Power plant in which a vapour is used to heat a gaseous working fluid.—C. W. Kay. Oct. 4 1948. 643,598.

Photographic developers.—E. I. Du Pont De Nemours & Co. March 4 1948. 643,411.

Hydrocarbon synthesis.—Standard Oil Development Co. April 1 1948. 643,606.

Purification of oxo-alcohols and esters thereof.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 9 1948. 643,610.

Processing of wool wax alcohols and products derived therefrom.—Fulmer Research Institute, Ltd., and E. S. Lower. April 4 1949. 643,422.

Production of acetic anhydride.—Courtaulds, Ltd., P. K. Williamson, and D. L. Tyler. June 1 1949. 643,620.

Resistance welding apparatus.—Mallory Metallurgical Products, Ltd. June 8 1948. 643,622.

Process for the manufacture of salts of D-tubocurarine and its alkyl and aryl ethers.—Allen & Hanpurys, Ltd., and C. J. Eastland. March 4 1949. 643,425.

Incandescent mantles for lighting and heating appliances.—Tilley Lamp Co., Ltd., and W. G. Colle. May 23 1949. 643,638.

Process for the absorption of carbon monoxide.—Power-Gas Corporation, Ltd., and L. Krsyszkowski. Aug. 26 1949. 643,431.

Liners for cylinders.—Norton Co. Nov. 8 1948. 643,435.

Process for the refining of glass.—Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De St.-Gobain, Chauny, & Cirey. Jan. 12 1949. 643,438.

Construction of gun for spraying heat-fusible materials.—Metallizing Engineering Co., Inc. July 7 1949. 643,569.

Process for producing shaped products from thermosetting synthetic resins.—Dunlop Rubber Co., Ltd., W. H. Chapman and M. Goldstaub. April 19 1947. 643,845.

Refractory or abrasive materials and methods for their manufacture.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny & Cirey. Aug. 27 1946. 643,653.

The
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The Demand for Fertilisers

THE removal of substantial proportions of the subsidies on fertilisers on July 1 has confined most British interest in this subject to the domestic scene. Will fertiliser demand drop as a result the rise in prices? This question has preoccupied manufacturers throughout the year and there is still no firm answer. The latest commodity report from the Food and Agriculture Organisation, which is devoted to fertilisers, indicates that the same question is also being asked in many other parts of the world.

In those countries whose fertiliser industries were not shattered by the war there have been ten years of unparalleled expansion. Likewise, in countries whose factories were severely damaged or whose raw material supplies were cut off, there have been at least five post-war years of vigorous re-building. Consumption in this period has been limited only by production. The FAO report says that now "for the first time since the war, world supplies of most fertilisers are sufficient to meet effective world demand," and expresses the opinion that "the present is an important period of transition in the world production and consumption of commercial fertilisers."

Three separate factors influence the volume of fertiliser consumption. These are the tonnage made available, the tonnage required for the agronomic needs of crops and soils, and the total amount farmers are prepared to invest. The second factor, though idealistic from the technical standpoint, has never yet been able to exert the dominant influence. Throughout the recent years of expansion the first factor has ruled the market; the tonnages applied to the world's soils have been as large as they could be, but never within any distance of the tonnages ideally required for optimum cropping. Now, the third and economic factor has returned. The FAO report indicates that factors other than supply are slowing down the demand for all fertilisers. In some areas less favourable relationships between agricultural and fertiliser prices are an important adverse influence. The inability to purchase because of the financial considerations has kept some countries from meeting fully their import requirements. It is expected that during 1950-51 such factors will tend to exert more influence on the amount of fertilisers consumed than will either the actual agronomic needs, or the status of the world's supply.

It is unlikely that there will be any immediate recession in fertiliser con-

On Other Pages

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sumption. Indeed, estimates collected by FAO from most governments indicate that there will be a 7 per cent rise in both output and use during 1950-51. Estimates at a time of transition are, however, liable to be uncertain guides. All manufacturers will have planned for continued increases in output and sales but they can quickly curtail production if demand itself declines. The chances of continued expansion seem brightest in Europe, where the biggest increases, both as percentages and as real tonnages, have been shown in 1948-49 and 1949-50. By comparison, the tonnage increases in America have been small and those in Asia and Africa insignificant. The expansive force in Europe must still carry a considerable momentum. Also, most European countries are determined to produce as high a proportion of their total food needs as possible and for such plans as these fertilisers are indispensable. Nor is the economic factor seriously worsened in Europe by hard currency complications.

Europe, as a whole, produces more than its own requirements of potash and nitrogen, and its phosphate mineral needs can be met from North African deposits. It may be feared that the effects of de-subsidisation in this country will be restrictive, but it should be remembered that some other European countries discarded their wartime fertiliser subsidies two or three years ago.

The most serious consequences of any recession in fertiliser demand will be manifest in Asia, Africa, and possibly in South America. In these under-developed areas the total tonnage of fertilisers used is still very much less than that desirable, both for good rates of cropping and for soil conservation. In recent years there has been steady expansion, particularly in Asia, and it seems essential for this trend to continue. The technical or agronomic influence has to combat many prejudices in these areas and the progress made since 1948, which may not represent large tonnages by European or American standards, is certainly a notable scientific and administrative achievement. It would be a tragedy if these developments were halted by the intervention of economic factors. Food is, or should be, the birthright of all and the direct means of growing better crops must be made available to the worst-nourished populations of the world.

Notes and Comments

Benzol Sources

AS an instance of the permanent practical benefits in peacetime of co-operative work for wartime needs the full report on benzol and toluene from British coal gas undertakings seems to be outstanding. The regrettable likelihood that the clamant demand for these essentials in many departments of industrial chemistry will be accentuated by a rearmament programme heightens the value of the studies of common production methods and possible improvement and of the value in this connection of different regional coal resources. The detailed results relating to such practical aspects will certainly commend the report to those in industry at least as warmly as the statistical sections will appeal to those who need only the statistics. Government interest in promoting industrial efficiency seldom operates as effectively as did this investigation, for which the Gas Light and Coke Company in 1941 made their experts available to the Ministry of Fuel, until the work was completed in November, 1945, after 644 visits to gas works. The better yields of benzol from coke oven plants in general was recognised by their virtual exclusion from this survey. One of the facts which emerge conspicuously from this report is the scope which existed in 1941, and possibly has not yet been fully exploited, to raise benzol yields by the employment of more up-to-date plant and methods and by greater discrimination in the choice of coals. That possibility is emphasised by what was achieved in four war years, 1939-1943, during which gas works raised their output of crude benzol from 24.3 to 39.4 million gallons a year.

Technical Training

HARD upon the news that the Parliamentary and Scientific Committee has recommended an all-round general increase in the training facilities for young technicians in Great Britain comes the report of the United Kingdom Mission to Pakistan, in which one of the suggestions is that suitably trained men be sent to Pakistan "to train the factory workers and to see the factories through their initial troubles." A question put by a CHEMICAL AGE representative at a Board of Trade Press conference last week as to how this latter proposal can be reconciled with the recommendations of the Parliamentary and Scientific Committee met with the answer that the British technicians would be allowed to go for "as short a period as possible." This statement, coupled with the further suggestion by the mission that Pakistan student technologists in the U.K. be allowed greater facilities for study, leads one to believe that in the matter of economic and technical recovery Britain must needs dissipate her resources in sending skilled men out of the country during a period when they will be needed most and at the same time allowing the already overcrowded training facilities in the U.K. to become even more so. This does not seem fair to the young people about to enter British industry, who will require all the help and teaching that our skilled workers and technologists can give during their apprenticeships and trade courses. There can, of course, be no suggestion that anyone denies the people of Pakistan the right to set up factories and plants with the aid of British skill. It is merely a question of what form that aid will take. It would be most unwise to allow any official scheme for the training of Pakistani personnel, either in this country or in Pakistan, to interfere with projected expansions of training facilities for British workers.

Summer School for Analysts

THE inability of normal educational systems to deal amply, sometimes even adequately, with the current multiplication and refinements of the techniques of chemistry, is again recalled by the keen and widespread

response to the summer school in analytical chemistry which has been in progress in London this week. Even more significant than the numbers who registered for this pioneer attempt to provide for analysts the kind of supplementary study made available in some other science departments, in the countrywide distribution of those attending it. While analytical chemists are training in all parts of the British Isles, it is highly unlikely that more than a few would in present conditions think it worth transporting themselves to London for a week from places as remote as Wick, Edinburgh and Swansea—as numbers have done on this occasion—if familiarity with various aspects of polarography, absorption and emission spectroscopy, organic microanalysis and radiochemical analysis could be acquired in vacation nearer home. That is no criticism of the admirable provincial training centres. It does, however, call to mind the increasing complexity of the analyst's training needs imposed by the introduction of new techniques, most of which are characterised by their time-saving and so are becoming indispensable. By mustering an authoritative panel of lecturers on these and similar subjects the London and S.E. Counties section of the Royal Institute of Chemistry and their collaborators, the Society of Public Analysts and other Analytical Chemists, have provided another aspect of private, and entirely voluntary enterprise in supplying a need which will certainly be no less urgent in future years.

Seaweed Chemicals

A RECENT report in *The Times* has once again drawn attention to the value of seaweed research in revealing new potentialities of wealth around the coasts of Great Britain. In about a year's time it is estimated the Scottish Seaweed Research Association may be able to assess fully the true economics of chemical production from algae. It will be recalled that Lord Bilsland, chairman of the Scottish Council (Development and Industry) recently expressed the fear that others might be more active than we in utilising the results of these researches. The number of firms processing and marketing seaweed has trebled in four years, while there has been a six-fold increase in the number of collectors. Lord Bilsland estimated that the output of the five British firms producing alginates and agar is worth £700,000 per annum. A concrete advance is represented by the fact that attention has been diverted from the wasteful burning of seaweed, with iodine as the sole product, to chemical treatment for the extraction of organic chemicals. The researches which led to the substitution of the pre-war Japanese agar are now a minor classic. In place of the *Gelidium* red algae, methods based on *Chondrus crispus* and *Gigartina stellata* were developed. Various grades of agar were produced suitable for bacteriology, the testing of penicillin, the replacement of gelatin and pectin in foods, and for application in edible and pharmaceutical "creams." This British agar substitute proved in some respects—in ease of solution and by having a lower melting point—to be an improvement on the Japanese material. There is ample evidence that chemists and chemical engineers have been equal to all the problems presented so far. Large-scale mechanical harvesting, however, remains a study in which much more work remains to be done.

Test Borings for Lead

FIRST test borings are soon to be made on the stretch of moorland between Wirksworth and Matlock, Derbyshire, in an attempt to decide finally whether the lead mines in the locality have economic possibilities. This is the second stage of the enterprise by the Derbyshire Stone Co. and the £12.7 million scheme of the Johannesburg Consolidated Investment Co. and follows almost six months of geological survey work. Experts have named sites where it is believed lead seams are thick. If these are confirmed new shafts will probably be sunk as a more economic proposition than developing old ones. Work is centred on the Magpie Mine, which has been derelict for 80 years and has never been explored with the resources available to modern mining.

£20 m. MORE FOR CHEMICALS

Finance for Expansion of I.C.I.

THE second of the exceptionally large additions to the funds employed by chemical industries in this country is foreshadowed by last week's announcement by I.C.I., Ltd., that it had received the consent of the Capital Issues Committee to issue £20 million 4 per cent unsecured loan stock.

This is to be secured by a private placing in the London market of unsecured loan stock redeemable at par in 1960, or at 101½ in 1958 or 101¼ in 1959, should the company wish to clear the loan earlier. It will bring to a total of £40 million the new capital acquired by I.C.I. since the war, the need for which is fully explained by the almost unparalleled scale of the expansion schemes projected or in progress of several of the chemical and metal divisions, the continued enlargement of the research programmes and the facilities for them, and I.C.I.'s participation in the new enterprises for the production here of refined petroleum and petroleum derivatives. The previous addition to I.C.I. funds also procured £20 million, on that occasion readily subscribed by stockholders invited to take up one new ordinary £1 share for each five already held, at a price of 40s. 6d. The alacrity with which that capital was subscribed provided remarkable confirmation of the confidence of further prosperity for large-scale chemical enterprise.

Plant *versus* Arms Production

SOME Scottish chemical engineering concerns are advising customers at home and abroad that requirements over the next two years should be ordered now. The advice has been given in the light of experience in 1939 when armament production went into gear. Firms in the engineering industries which were then given specific duties could again be called on to handle armament and component work.

The orders which were on the books during the last period of rearming were permitted to go through; many were in a semi-completed stage. Chemical engineers foresee that they are likely to be brought in, to a greater or less extent, on armament production and that some curtailment of plant manufacture would be inevitable. They anticipate that priority will continue to go to export orders, for which a substantial volume of business remains on hand.

PETROCHEMICALS' FUNDS

Need for Further Capital

THE excess of plant costs over estimates was largely responsible for the need for more money announced by Petrochemicals, Ltd. A further £2½ million is required by the company which is constructing a chemicals-from-oil plant at Partington, near Manchester. Out of this additional capital £900,000 will be temporary advances from the Finance Corporation for Industry, and will be repaid.

Sir Robert Renwick, the chairman who was appointed some weeks ago at the request of the Finance Corporation for Industry, gave his opinion that the basic conception of the Catarole plant was sound.

The novel nature of much of the machinery required had added to expenditure. This was particularly so in the case of the plant necessary for the separation of gases produced in the cracking furnaces and then utilised for the production of the most valuable end products of the whole set-up. The gas plant is now capable of producing the separated gases required for the ethylene and propylene conversion plants which should shortly be coming into operation.

Estimated cost of the project was expected to be £4.3 million, including £220,000 for working capital. With the £2.5 million now required, the total capital involved will be nearly £10 million. Devaluation has increased the cost of basic materials, fuels and certain chemicals by nearly £450,000 a year.

Chemical Exports to Turkey

THE third most important group of imports into Turkey from Britain consists of dyestuffs, chemicals and pharmaceuticals, states an article in the current week's *Board of Trade Journal*, on the development of U.K. trade with Turkey. In general, British products meet Turkey's requirements satisfactorily in all these lines, in which before the war Germany held about 90 per cent of the market, but British manufacturers must expect to have difficulty in maintaining the position they have gained, in view of the revival of German competition.

The total value of British exports to Turkey in 1949 under the category of "chemicals, drugs, dyes and colours" was £956,895, compared with £1,169,177 in 1948 and £798,898 in 1947. Roughly one-fifth of the 1949 figure was for "finished dyestuffs obtained from coal tar."

Instruments for Export

SIMA Report on Packaging Failures

THE consistent bulk and value of Britain's exports of scientific instruments (THE CHEMICAL AGE, 63, 285) lends point to the practical suggestions offered, at the recent annual general meeting of the Scientific Instrument Manufacturers' Association for improved methods of packing.

Discussion of this was stimulated by the chairman's disclosure that general complaints had recently been received from abroad, and in particular Australia, of the unsatisfactory condition in which instruments were arriving at their destinations.

Feeling in this matter was reported to be so strong that countries at the present time importing from this country were expressing a general desire to buy instruments from America as soon as the dollar situation became easier unless the quality of British packing substantially improved. Not only did instruments arrive in damaged condition, but considerable money and time had to be expended before the instruments could be satisfactorily unpacked and made ready for use.

It was suggested that the materials used in packing were frequently unnecessarily bulky and unsuitable. Wood wool, for instance, although tightly wedged during the operation of packing, would easily compress and shift during a long journey overseas, thus exposing the instrument to shock and moisture. In addition, the large quantities of materials such as wood wool required to pack an instrument presented a severe encumbrance to the receiver.

The SIMA report notes that the Americans, who held an enormous lead in protective packing, often employed light-weight cartons for the transport of instruments, and it might well be that what was needed in this country was not so much an improved method of packing as a more scientific one. Carton packing was used by other industries in this country with complete safety and effectiveness. Every day in goods yards and haulage departments radio sets, glassware, fragile and even heavy equipment were being transported in cartons, with no evidence of the bulk crates and boxes so widely identified with the instrument manufacturer.

Experiments were showing that light weight packing materials could be safely used and that they afforded ample protection for even delicate instruments. Rubber mountings and simple devices with welded rubber joints could be substituted for wood and other fillings. Cellophane wrappings for instruments could be used in order that Customs inspection might be made without disturbing the protective outer layers. Expensive packing materials were not necessarily the best and research and experiment might provide new methods of scientific packing which were both cheaper and more effective.

Drug Sales to Australia

THE prospect of substantially larger sales of drugs to Australia is associated with the acceptance there of a modified system of distributing free medicine which came into operation this week in the Commonwealth. Free distribution is confined to 185 costly drugs. These include all the sulpha drugs, penicillin, insulin, and vitamin B_{12}, used in the treatment of anæmia.

Members of the British Medical Association, who opposed the first scheme to give free distribution of about 600 prescriptions, because it would have limited the practitioner's discretion in the treatment of patients, are co-operating unreservedly in the new scheme.

Official overseas trade figures for 1949 show an item of £153,806 worth of proprietary medicines exported by Great Britain to Australia.

Too Few Applied Scientists

SIR EWART SMITH, director of I.C.I., Ltd., speaking before the British Association in Birmingham this week, emphasised that neglect to make applied science and technology widely available to industry had greatly retarded industrial progress in this country. He contrasted the situation here with that in the U.S.A., which, industrially, now enjoyed the pre-eminence that once belonged to this country. That circumstance was directly connected with the rate at which applied scientists were trained and used in industry. Between the wars, in Great Britain the ratio of first degrees in all faculties was 1.5 per 100,000. In the U.S.A. that ratio had increased to 8. Pure science here still predominated over applied science, so that we continued to make knowledge available, leaving its development to other countries.

BENZOL PRODUCTION

Four Years' Study of Gas Works Processes

THE most comprehensive review of the technical aspects of benzol production at gas works employing many different coals and differing in many respects in procedure is provided in the publication by the Ministry of Fuel this week of the results of four years' study by fuel technologists. (Benzol and Toluene from Coal Gas. Report on technical work 1941-1948; 5s. 6d.).

The technologists, seconded to the Ministry, began their survey during the war, in November, 1941, and concluded it in November, 1945. Over 300 gas works were visited and, as a result of these tests, a great deal of valuable information of scientific interest was obtained, which will be of value not only to fuel technologists in the gas, oil and coke oven industries but all industries, both in the United Kingdom and abroad.

The report includes 23 large tables of results, giving a complete picture of the benzol and larger carbonising plants in Great Britain and Northern Ireland.

Each test involved the actual measure ment of the benzol and toluene in the gases entering and leaving a benzol plant over a period of at least 16 hours. These experimental figures were then compared with those calculated from the known operational data and a great many scientific facts of value were disclosed.

The report makes available new information relating to the yields of benzol and of toluene obtainable from various British coals in various types of carbonising plant. It shows that the production of toluene was greatest from intermittent vertical retorts and gives the yields of benzol and toluene from many carburetted water gas plants, from a few Tully plants and from one low temperature carbonisation plant. Analyses of the benzols are given, with specific gravities of both benzols and toluoles. Correlation with carbonisation can be made for each test as full details are given of the dimensions and operating conditions of the carbonising plant.

Results for the recovery of benzol have been made available from tests carried out at all the works visited, including 41 tests on active carbon plants.

Information and comments are given on many aspects of production. The subjects include: the amounts of higher boiling materials in benzols produced from coal gas and carburetted water gas; on the types of benzol plant in use in December, 1945; on partition coefficients; on test methods; on washer and still efficiencies; on tower scrubbers; on packings in tower scrubbers; on new types of two-stage tower scrubbers; on the effect of re-circulation of oil in rotary washers; on benzole recovery in a washer operating under pressure; on unusual washers, stills and packings; on methods of operation to obtain optimum recovery of toluene; on "wet" stills; on the effect of seasonal changes in temperature; on the design and layout of plants; on instrumentation; on the effect of sludge; on the "wash-oil" content of recovered benzols; on the removal of intermediate fractions and phlegm oil; on attempts made to obtain restricted benzol recoveries on active carbon plants; on the effects of stripped gas on the distribution system and on methods of calculating recoveries from known operating conditions.

Reduced Scale of U.S. Chemical Exports

AMERICAN chemical exports in the first quarter of 1950 declined 20 per cent from similar exports during the same 1949 period. Shipments, valued at $182 million, were 12 per cent less than in the last quarter of 1949 and were the lowest for any quarter since 1947. American chemical exports are expected to continue the downward trend, at least for the balance of the year, according to the government bureau.

Medicinals and chemical specialities were the two largest export categories in the first quarter, accounting for more than 46 per cent of the total. Exports of industrial chemicals and coal-tar products showed sharp declines—of 39 and 56 per cent, respectively. Fertilisers, however, showed an increase, to $24,523,000 as compared with $22,855,000 in 1949. Paint exports were $19,322,000. Naval stores totalled $5,318,000, and sulphur exports were $7,162,000.

North America replaced Europe as the major market for U.S. chemicals. Chemical shipments to the United Kingdom dropped almost 50 per cent.

Rising Demand for Non-Ferrous Metals

Abnormal Request for Copper

CONSUMPTION of non-ferrous metals in the United Kingdom in July was higher than in the corresponding month last year, with the exception of tin which was slightly reduced. Closing stocks of lead improved, but those of unwrought copper (both blister and refined) were reduced.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	46,204	78,992
Imports	13,684	15,132
PRODUCTION:		
Primary ...	—	11,988
Secondary	1,989*	5,401
CONSUMPTION:		
Primary ...	12,128	26,538
Secondary	—	15,129
Exports	1,205†	1
CLOSING STOCKS:		
Govt. and consumers' ...	49,559	77,312

* Rough copper.
† Includes 904 tons of rough copper despatched to Belgium and 301 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,629 long tons
Alloyed copper products	24,046 ,, ,,
Copper sulphate	4,708 ,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	29,316	25,272
Imports ...	14,474	18,870
PRODUCTION:		
Virgin and remelted	—	5,407
CONSUMPTION:		
Virgin (incl. debased)	6,388	19,066
Remelted and scrap	-	7,381
Exports and re-export	4	1
CLOSING STOCKS:		
Govt. and consumers'	37,398	58,168

Production figures for the month were generally marked by an improvement, but the most outstanding item was lead, the figures being: concentrates 228 (37); English refined 5482 (2656).

Details given below are abstracted from the summary supplied by the British Bureau of Non-Ferrous Metal Statistics.

LEAD

	Long Tons			
	Lead in Concen-trates	Imported Virgin Lead	English Refined	Lead Content of second-ary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers'		67,857	6,262	--
Other stocks	72	—	—	--
IMPORTS ...		13,813	—	361
PRODUCTION	228	—	5,482	–
CONSUMPTION	253	12,409	5,751	7,435
EXPORTS ...	--	15	—	
CLOSING STOCKS:				
Govt. and consumers'		68,001	5,993	—
Other stocks	65		—	--

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period) ...	9,067
IMPORTS ...	—
PRODUCTION ...	--
CONSUMPTION ...	1,873
EXPORTS AND RE-EXPORTS ...	3,203

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS ...	386
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	251

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM ...	47.25

Further Increases in Copper Prices

THE price of U.K. copper was raised on August 31, by £16, from £186 to £202 a ton. Discounts premiums and forward charges remain unchanged. This followed an increase in the New York copper quotation. The Ministry of Supply announced that as from September 4, its buying price for rough copper in slabs of from 2 to 3 cwt. is increased from £144 to £156 a ton.

Abnormal purchases of copper, lead and zinc in the present volatile state of the market are considered by the Ministry of Supply to be unnecessary and undesirable.

To discourage excessive forward buying the Ministry has announced that additional charges for forward purchases would be increased as follows:—

	2nd and 3rd months after month of order		Previously		4th, 5th and 6th months after month of order		Previously	
	£	s.	£	s.	£	s.	£	s.
Copper	13	10	1	10	15	0	3	0
Lead	7	0	1	0	8	0	2	0
Zinc—	13	0	1	0	14	0	2	0

NEW ATOMIC PARTICLES DISCOVERED

Professor Blackett's Disclosure to the B.A.

DISCOVERY of two new atomic particles was announced this week by Professor P. M. S. Blackett at the annual conference of the British Association now in progress at Birmingham.

Cloud chamber photographs of the disintegration of very heavy unstable mesons taken both by Carl Anderson at Pasadena and by the British research team at the observatory some 9000 ft. up the Pic du Midi, were shown by the professor.

Two pictures taken in 1947 by Rochester and Butler first suggested the discovery, which seemed to indicate the existence of about 900 electron masses, which were spontaneously unstable. One was neutral and decayed into two charged particles, and the other was positive and decayed into a positive and a neutral.

This has since been confirmed by 34 more photographs taken at Pasadena, where the masses of the new particles have been estimated to be between 250 and 400 electron masses larger than the sum of the masses of the particles into which they decayed. In agreement with the American investigators, the new large mesons had been named V-particles. Anderson had suggested that some of them might be protons, but this was not yet confirmed.

The products of their disintegration were pi-mesons, which formed so much more familiar feature of cosmic radiation. Professor Blackett did not think we were yet able to estimate the lifetime of these V-particles.

Acceleration of Particles

One of the most popular sections was the mathematical one, at which the discussion of nuclear physics attracted a large audience, the majority of which consisted of the lay public and students.

The series of papers on "High Energy Particles and Machines for their Acceleration," was opened by Professor R. E. Peierls. Techniques that had led to the construction of machines that could accelerate particles to energies of a few hundred million electron volts were described, and the possibility referred to of developing machines to reach the region of a few thousand million electron volts.

A closer knowledge of the emission of light was essential to a clear understanding of the electric forces that governed the motion of electrons in atoms, said the professor. Faster particles would help to solve the problem of whether the proton—that is, the hydrogen nucleus—possessed, like the electron, a counterpart of opposite charge.

Recent developments in the linear accelerator, which has been modified to accelerate electrons, were described by Mr. D. W. Fry, of the Harwell Research Observatory, where it is used as a pulsed neutron source.

An account of the proton synchroton under construction at Birmingham was given by Dr. L. H. Hibbard. This is designed to accelerate protons to over 1000 million electron volts. After travelling 120,000 miles round the orbit of the machine the protons will reach a speed of 91 per cent of that of light.

Cosmic Ray Research

FOUR British scientists are to spend the winter at the research station on the Jungfraujoch—11,700 ft. high, and one of the highest in the world—where they will continue researches into the properties of tau-mesons, the showers of newly discovered penetrating particles produced when the atom is broken by cosmic rays.

The team from Manchester University is expected to arrive next month and will start its researches in November. The leader will be Mr. A. J. Newth, and the work will be under the general supervision of Professor P. M. S. Blackett.

A Wilson Cloud Chamber and a 14-ton magnet will be among the heavy equipment brought by the scientists. Cosmic ray phenomena produced in the cloud chamber occurs approximately 20 times more frequently at the height of the research station than in British cities.

Another party of scientists from Bristol University under Professor C. F. Powell, is expected to visit the Jungfraujoch during the winter to photograph the trajectories of radioactive particles by a different method.

New Plants in Israel

Israel plans the erection of a cement factory near Hadera in addition to the Nesher Cement Works, the production of which has reached 26,000 tons per month. A plastic factory has begun production at Bnei Brek, near Tel-Aviv.

ANGLO-U.S. REFINERY

Powell Duffryn and Vacuum Oil Co.

THE boards of Powell Duffryn, Ltd., and of Socony-Vacuum Oil Co., Inc., of New York, have indicated that the collaboration foreshadowed in a joint statement in March has taken effect and that the property at Coryton formerly owned by Cory Brothers & Co., Ltd., has now been acquired by Vacuum Oil Co., Ltd. From September 1 the business previously carried on at Coryton by Cory Brothers is being continued by the Vacuum company as an addition to its present business.

The board of directors of Vacuum Oil Co., Ltd., has been enlarged by the addition of four Powell Duffryn Group nominees and now consists of Mr. J. C. Gridley (chairman), Mr. H. W. Rocke (managing director), Mr. J. S. Vesey Brown, Mr. W. M. Codrington, Mr. Charles Lawrie, Sir Herbert Merrett, Mr. J. Blake Middleton (U.S.A.), Mr. Miles Reid and Mr. H. V. Vale.

Work Begins at Coryton

The preliminary design work for the construction of the new oil refinery at Coryton has been completed and the necessary consents have been obtained. The Lummus Co., Ltd., petroleum industry engineers, have been appointed principal contractors to the refinery project. Work on the building of roads and the extension of the existing private railway has been started. The target date for the completion of the refinery is January 1, 1953. Practically the whole of the plant and equipment will be manufactured in this country.

The expenditure on the refinery and on other works at Coryton and elsewhere will be financed in part by Powell Duffryn and Socony-Vacuum. The Finance Corporation for Industry, Ltd., will make available the balance required for the construction programme.

Oil Prices Increased

THE maximum prices of gas (diesel) oil and Derv oil for road vehicles were increased by three-eighths of a penny a gallon on September 4. The new rates are these:—

Gas oil (diesel oil): Inner zone, 1s.; outer zone, 1s. ¼d.; general zone, 1s. ½d.

Derv: Inner zone, 2s. 6¾d.; outer zone, 2s. 7d.; general zone, 2s. 7¼d.

All these prices refer to bulk deliveries by oil companies.

YOUNG CHEMISTS' ESSAYS

Good Performance Rewarded

AT the conclusion of his presidential address to the British Association at Birmingham last week, Sir Harold Hartley announced the names of the prize-winners in the scientific essay competition which has been sponsored by *Endeavour*, the quarterly science review published by Imperial Chemical Industries, Ltd.

The competition, of which details were announced in February, was for young scientists only, with the object of stimulating their interest in the work of the British Association and encouraging the writing of good English. There was an age limit of 25 years for all competitors. Competitors had to write a 4000-word essay on one of twelve given subjects.

Good Response

The response was considerably greater than was anticipated. 117 essays were submitted and the very high standard of the great majority made the judges' task extremely difficult. The prize-winners are as follows:—

The 50 gns. is awarded to 24-year-old W. J. T. Dunstan for an essay on "Phenomena at Low Temperatures." He was educated at Stratford Grammar School, London, and at Wadham College, Oxford. In 1946 he became assistant in physics at University College, Dundee, and last year was appointed lecturer in physics at Northern Polytechnic, London.

The second prize of 25 gns. is awarded to 22-year-old S. J. Adelstein for an essay on "The Biological Significance of Trace Elements." He is an American citizen and a graduate of the Massachusetts Instistute of Technology.

The third prize of 10 gns. is awarded to 23-year-old F. J. C. Rossotti for an essay on "Radioactive Tracers." He won an Open Postmaster scholarship to Merton College, Oxford, from Christ's Hospital, Horsham.

In addition, a special prize of five guineas has been awarded to 17-year-old R. D. Cohen, of Clifton College, who sent in an entry of unusual merit for so young a competitor.

I.C.I. Resumes Mineral Search

Hoping to procure potassium brine and natural gas in sufficient quantities for use at their new Wilton factories, I.C.I., Ltd. has resumed boring at Eskdale Gate Farm, near Whitby. Similar operations are to be started by the company at nearby Rockhead Farm, Skelder.

THE SIGNIFICANCE OF CHROMATOGRAPHY

"Greatest Single Advance in Chemical Technique"

THE advancement of science depends on many things, but not least on the perfection of new techniques for collecting the facts from which new discoveries may arise. In chemistry the last fifteen years have seen the development of a new technique—chromatography—which has proved of the greatest value and led to important progress in almost every branch of the subject, said Dr. Trevor I. Williams, deputy editor of *Endeavour*, in the course of his paper read before the chemistry section at the British Association's meetings in Birmingham on Monday this week.

Many, indeed, see in chromatography the greatest single advance in chemical technique of this century, said Dr. Williams. The method was originally discovered about fifty years ago by a botanist, Michael Tswett, of Warsaw University, who used it with great success for analysing the various important pigments—such as chlorophyll—which are present in plants. He discovered that when a solution containing different pigments is allowed to percolate under special conditions through a column of powder—such as fuller's earth—contained in a glass tube, the different pigments separate in bands at different levels on the column.

Unfortunately the importance of Tswett's discovery was not generally recognised at the time, and it was many years before chemists began to make use of it. In 1931 it was applied with great success, to studying the properties of natural pigments related to Vitamin A. The success of chromatography in this very important research at once attracted the attention of chemists all over the world and thereafter chromatography became increasingly widely used.

Partition Chromatography

In 1941 chromatography received a great stimulus when the British research chemists Dr. A. J. P. Martin and Dr. R. L. M. Synge invented a completely new type of chromatography which they called "partition chromatography". This has been exceedingly valuable, especially in the medical field. It has been applied particularly to the study of substances called amino-acids, the single building bricks from which all proteins are built up. A great feature of the new method is the extremely tiny quantities of material needed for analysis; a single hair or a small drop of blood are, for example, sufficient. The great importance of this work was marked earlier this year by the election of both Dr. Martin and Dr. Synge to Fellowship of the Royal Society.

Dr. Williams referred to the account of this important new method and its results which would be given later that day in the chemistry section by Dr. C. E. Dent, of University College Hospital Medical School, London, who had used it very extensively as an adjunct to medical research and had made important contributions of his own, especially in studying the composition of the body fluids.

Great Possibilities

In this field, continued Dr. Williams, it is no exageration to say that chromatography is opening up a new world of investigation. In the form in which Dr. Dent and most other research workers are using partition chromatography, a sheet of blotting paper is the material on which the analysis is made. With the aid of various solvents the constituents of a mixture are spread out so that each occupies a different spot on the paper.

The chromatographic analysis of inorganic substances came to prominence during the war, although for reasons of secrecy the great progress made was not disclosed until the end of 1947. For the purposes of chemical and biological examination it was necessary to separate the very tiny quantities of fission products which were obtained in the various atomic energy projects. Chromatography alone proved generally capable of separating these minute amounts and an additional form of the method was developed in which the analyses were made on columns of substances very similar to those used in ordinary domestic water-softeners.

This form of chromatography is called "ion-exchange chromatography". The method has revolutionised the separation of important metals known to chemists as the "rare earths". The similarity of these formerly made their separation a matter of months or even years of laborious work; now many of them can be separated by chromatography in a few hours.

ION-EXCHANGE RESINS

Their Many Practical Developments and Possibilities

From A CORRESPONDENT

THE exchange of cations between a solid and a solution was first demonstrated exactly a century ago. At that period there was much interest in the behaviour of synthetic fertilisers in soil. An explanation was sought for the observation that ammonium and potassium cations, added as soluble salts, were tenaciously held in soil despite the leaching effect of rain-water.

Ammonium Ions Retained

In 1850 Thompson showed that when aqueous solutions of ammonium salts were passed through a bed of soil in a column, the ammonium ions were retained by the soil and the effluent solution contained calcium and magnesium ions. This original observation was confirmed and greatly extended by the work of Way, who proved that cations other than ammonium were absorbed by soil, an equivalent amount of calcium being released. Later, Way prepared in the laboratory a hydrated sodium alumino-silicate which was capable of absorbing ammonium or potassium ions by exchange with sodium.

It is now known that the exchange properties of soil are in part due to organic substances, e.g., the humic acids, and in part to the clay minerals. In general, the latter are crystalline and very finely divided, but owing to their large surface and laminar structure, water can permeate the crystal layers. This porosity permits the entry or removal of cations in solution. These minerals may be regarded as salts consisting of undisturbed complex anions and exchangeable cations. Many other minerals possessing similar structural features exhibit cation-exchange.

At the beginning of this century, the principle of cation-exchange was utilised by Gans to soften water. In this process, calcium and magnesium ions were removed from hard water by exchange with sodium ions, supplied by synthetic aluminosilicates — Permutits The success of this process led to the search for improved exchange materials. Greater stability to acids, permitting exchange between cations in solution and the hydrogen or acid form of the exchanger, was displayed by products obtained from the partial sulphonation of coal. The permutits and the sulphonated coals are still used in water-softening, but in 1935 a discovery was reported which has provided a wide range of new exchange materials with a vastly extended field of application.

The discovery by Adams and Holmes that certain synthetic resins possessed ion-exchange properties was the result of collaboration at the Chemical Research Laboratory between two groups working on apparently unrelated topics. In connection with a general study of water-pollution, a search was being made for a substance likely to remove iron from water.

It was thought that an insoluble derivative of gallic acid might be suitable and by analogy with the phenolformaldehyde resins, which were being studied elsewhere in the Laboratory, gallic acid was condensed with formaldehyde. The product was insoluble in water and acid, and removed iron completely from dilute ferric chloride solutions.

The successful exchange of cations by resins containing acidic groups suggested that basic resins might be effective for the absorption of acids and exchange of anions. Such resins were prepared by condensing aniline or *m*-phenylene diamine with formaldehyde.

Water De-ionisation

This work was of fundamental importance for two reasons. In the first place, the phenomenon was no longer restricted to the exchange of cations; it became "ion-exchange". This fact made it possible to remove both cations and anions from water, by-passing the raw water first over an acidic resin in the hydrogen form to absorb cations and then over a basic resin to remove the acids formed in the first step. "Water-softening" became "water-de-ionisation." Secondly, ion exchange properties became associated with synthetic high polymers. Knowledge accumulated in the broad field of high polymer chemistry has enabled ion-exchange materials to be made possessing improved properties and of well-defined constitution.

The manufacture of ion-exchange resins is not a large industry, but within 10 years of the publication of the paper by Adams and Holmes, the production in Germany alone reached the level of 1000 tons a year.

The progress of this industry has been reviewed by K. W. Pepper, PhD. (Lond.), of the Chemical Research Laboratory. Discussing the chemical constitution of ion-exchange resins, Pepper refers to a monofunctional, strongly acidic resin developed in the United States during the war. Styrene and a small proportion of divinyl benzene are copolymerised in an aqueous suspension. The spherical particles of copolymer are then sulphonated directly with concentrated sulphuric acid, yielding sulphonated cross-linked polystyrene.

This material possesses excellent chemical stability, either in the free acid or as a salt. Of great importance, also, is the ease with which the extent of cross-linking can be varied, simply by varying the proportion of divinylbenzene in the monomer mix.

A monofunctional, weakly acidic resin has been prepared by copolymerisation of methacrylic acid with divinyl benzene, yielding cross-linked polymethacrylic acid. Under alkaline conditions, this material has a high total capacity (10 mg.-equivs. per dry g.) due to the high concentration of carboxyl groups.

The earlier anion-exchange resins, prepared by condensing *m*-phenylenediamine with formaldehyde, contain a variety of weakly basic groups. Some increase in basicity has been obtained by incorporating aliphatic amines in a phenol-formaldehyde resin. Very recently, strongly basic anion-exchange resins have become available; they are believed to contain quaternary nitrogen groups. The chemical stability of the anion-exchange resins is generally less satisfactory than that of the best acidic resins.

Acidic Conditions

Studies of anion-exchange equilibria have been restricted by the fact that, until very recently, the only available resins were weakly basic in nature. Ionisation of such materials is negligible in alkaline or neutral solutions and investigations were therefore confined to acidic conditions. It was not possible to decide whether the mechanism was one of "acid-absorption" or "anion - exchange". Exchange of anions is, however, unequivocally observed at neutrality with strongly basic resins.

Exchange by equivalents obtains, provided the equivalent weight, appropriate to the conditions of experiment, is taken. Thus phosphates exchange as H_2PO_4 at low *p*H and as mixtures of $H_2PO_4^-$ at neutrality. Regeneration of the strongly basic resins from the salt form to the free base requires a large excess of alkali, which indicates that the hydroxyl anion has a low affinity for these resins.

Much work remains to be done on the kinetics of ion-exchange. Exchange proceeds rapidly with the strongly acidic or strongly basic materials. For example, sulphonated cross-linked polystyrene of particle-diameter 0.1 to 0.2 mm., can be readily titrated electrometrically with alkali, the *p*H readings being steady within a few minutes of the addition of alkali.

The rate of exchange increases with decrease in particle size under all conditions. This fact suggests that the rate-controlling step is not the chemical exchange process itself but some diffusion effect.

Film Diffusion

The rate of exchange with sodium ions and certain resins may be controlled by "film-diffusion" or "particle-diffusion", depending on the conditions. With larger cations, especially organic cations such as quarternary bases, the rate of exchange is normally controlled by particle-diffusion. To add to the complexity of the problem, it is now known that the extent of cross-linking or "molecular porosity" of the resin affects the rate of exchange.

At present the only large-scale application of ion-exchange is in water-treatment, which includes water-softening and water-de-ionisation. Ion-exchange provides the cheapest industrial process for preparing electrolyte-free water, provided the solids content of the raw water is not unduly high (less than 500-700 p.p.m.). In water-softening, hard water is passed over a cation-exchange resin in the sodium form. Organic cation-exchange resins are replacing siliceous materials in water-softening because of their higher capacity and because they do not impart silica to the water. A further advantage of the organic materials is their greater stability to acids, which enables a "hydrogen-cycle" to be employed. The chief use of the hydrogen-cycle is water-de-ionisation, which requires in addition a second step, the removal of acids on a basic resin.

In the first stage, sulphates and chlorides are converted to the corresponding acids; bicarbonates give carbonic acid which can be removed by aeration. Regeneration of the cation-exchange resin is effected with sulphuric acid, sodium hydroxide or sodium carbonate being employed for the anion-exchanger.

The efficiency of the process as a whole largely depends on the extent to which cations are removed in the first step. This is influenced by the relative proportion of bicarbonate ion to sulphate or chloride

ions in the raw water. Carbonic acid, produced from bicarbonates, is a weak acid and only partially ionised, hence the forward reaction goes nearly to completion. In contrast, the strong acids obtained from sulphates or chlorides, being fully ionised, oppose the forward reaction. It may be necessary to repeat both steps in a four-bed process in order to prepare good quality water. On the industrial scale, the ionic content of water can be reduced from 250 p.p.m. to 2-3 p.p.m. at the rate of hundreds of gallons per minute.

Mixed Bed De-ionisation

More complete removal of ions results from the use of a strongly acidic resin mixed with a strongly basic resin in a single bed. By this means, the repeated plate-effect is obtained and "mixed bed de-ionisation" provides an excellent process for preparing high quality water. In the Chemical Research Laboratory, 50 litres of water (specific conductivity, 1×10^6 ohms or better) have been obtained from tap-water using a bed of mixed resins, 11 in. high and 2 in. in diameter, containing 100 g. cation-exchange resin and 200 g. anion-exchange resin. Before regeneration, it is necessary to separate the two resins by flotation in brine.

Removal of salt from sea-water by ion-exchange to give drinking-water is theoretically possible. The scheme is of no practical importance, however, because the volume of water obtained is only slightly greater than the required volume of resins. The salinity of sea-water is roughly 3 per cent or 30,000 p.p.m. A siliceous exchanger in the form of its silver salt, together with silver oxide, was, however, employed for this purpose during the war.

Use in Sugar-Refining

The processes used in the de-ionisation of water have been applied to sugar-refining. Sugar solutions, obtained by extracting sugar-cane or sugar-beet with water, contain organic and inorganic impurities, the removal of which increases the yield and quality of sugar and decreases the molasses requirement. The following steps have been employed in full-scale trials; removal of cations on an acidic resin, adsorption of organic impurities on activated carbon, and removal of acids on a basic resin.

Several schemes have been proposed for the recovery of metals by ion-exchange. During the war I.G. Farbenindustrie (Dormagen) employed a cation-exchange resin to recover copper from cuprammonium waste liquors; full-scale plant for the recovery of silver from photographic wastes was also constructed in Germany.

Possibly the most spectacular application of ion-exchange chromatography has been the complete separation of the rare earths and their preparation on the gram scale by American workers under the U.S. Atomic Energy Commission.

The method developed was a modification of the "elution" technique used widely in adsorption chromatography. In this a mixture of cations is absorbed at the top of a column of acidic resin. The cations are then moved down the column by washing or "eluting" with acid, those possessing a low affinity for the resin moving more rapidly. The affinities of the rare earth cations are very similar and simple elution was ineffective as a means of separation. Success was achieved by elution with an acid (e.g., citric acid), which forms a weakly dissociated complex with the rare earth cations. Fortunately, the rare earths which form the most stable citrate complexes also possess low affinity for the resin, so that the very small differences in affinity are enhanced.

Separation of Amino-acids

Ion-exchange chromatography has proved a most effective method for separating the complex mixtures of amino-acids obtained by hydrolysis of proteins. Pepper also mentions the extraction of alkaloids, the preparation of colloidal solutions, and the use of cation-exchange resins in the hydrogen form as catalysts.

Ion-exchange chromatography is established as a valuable technique in chemical and biochemical research. While large-scale industrial application is still virtually confined to water-treatment, there are good grounds for the view that further applications may be expected as a result of the recent development of improved materials and increased knowledge of their fundamental properties.

Metal Price Changes

THE Ministry of Supply has announced that, as from September 2, the price of good soft pig lead has been increased by £8, from £112 to £120 per ton delivered.

The price of tungsten ore was increased by 5s. on September 4, to between 195s. and 205s., nominal, a unit.

Tin prices fell by over £30 a ton on September 4. At the closing session business was done at the level of £729 per ton, for delivery in three months.

The price of quicksilver rose to between £20 15s. and £21 15s. a flask, on September 4.

CHEMICAL SALVAGE

Profitable Applications in Many Industries

by I. BERKOVITCH, M.Sc.(Tech)., A.R.I.C.

ROUGHLY a century ago legal action had to be taken to prevent manufacturers from discharging hydrochloric acid into the air. Today it would need much more than this to prevent them recovering it as a saleable by-product. To that extent therefore we have enormously progressed in our attitude towards our natural resources. This example also shows how relative a concept is chemical salvage. Today's idea for saving a material which has hitherto run to waste, or for transforming it into a commodity of higher value, is undoubtedly salvage in the first instance; but the process soon becomes a normal and accepted part of industrial production.

A further striking instance arises in the petroleum chemicals industry. Today the chief source of hydrocarbons for chemical synthesis is the gas produced in petroleum refineries where "cracking" is carried out. Some 20 years ago these were considered usable only as fuel and, where no convenient market existed, the surplus was burnt off at a flare pipe. Yet today a major synthetic chemical industry is based on these former waste gases.

The rate of exploitation of all the world's resources of materials has increased at a rapidly increasing rate during many generations and it has now reached a stage where it must cause us all active concern. Thus, on the world scale there is the most urgent need for economising in the use of raw materials, preventing waste and upgrading waste so that it becomes usable. Very largely this tends to be a problem for the chemists working closely with chemical engineers, biochemists and economists.

Salvage from Waste

Scope for chemical salvage, however, arises in the individual factory which is discharging a waste product. Here very often a chemical investigation of the process as a whole results in salvaging further saleable material from the waste or even in eliminating the necessity to discharge waste. On the national scale one finds interest in salvage may develop due to the fact that a country is experiencing shortages of particular elements or of more complex materials. Attention is then directed to economising in the use of these materials, substituting for them or salvaging them where they have to be used and salvage is possible.

The shortage may be due to absence or poorness of natural deposits, or to shortage of foreign currency—notably dollars—or even to political opposition to certain purchases. In some areas, usually tropical, conservation of water is a prime necessity. These are very often what one may call "local" shortages. On a world scale, however, and irrespective of local or financial difficulties, there is a serious threat of world shortage of many resources.

Dangerous Shortages

The extent of such shortages cannot be assessed purely by current production and consumption figures, nor by price trends. Thus, before July of this year many minerals which are approaching exhaustion had tended to fall a little in price over the previous 18 months due to a tightening market. Tin, last year, showed a surplus of production over commercial consumption of about 40,000 tons, which is about a third of actual world consumption.[1] Yet reserves of this element are in danger of absolute exhaustion.

Estimates of mineral resources are continually varying and any one surveyor of this problem rarely agrees with his colleagues. Furthermore, prospecting goes on continually and new reserves of many materials are reported from time to time. Thus, solemn warnings over the past 20 years concerning imminent oil shortages have been made to seem ridiculous by the discovery of vast new fields in the Middle East. Great areas of the earth's surface remain unprospected, and it is little wonder that scant attention is paid by the public to the prophets of woe.

Among the optimists has been Sir Henry Tizard, who recently pointed out[2] that the total volume of minerals consumed is very small compared with the accessible volume of the earth. The total area of the earth's land surface is about 60 million square miles. If one considers one mile in depth as accessible to ordinary mining, the volume available would be 60 million cubic miles. From this vast volume there has been so far extracted about 20 cubic miles of coal, half a cubic mile of iron ore and half a cubic mile of other metals in the whole of man's plundering of this planet.

This type of analysis ignores many

questions. Deposits are not useful unless they contain some critical concentration of the material being sought. Millions of tons of, say, an element, widely dispersed may be less valuable to man than a few thousands of tons in appreciable concentration. Even when a mineral is in useful concentration it may not be workable for other reasons.

Coal may be in seams which are too thin or interbanded with too much dirt. Nevertheless, Tizard has fulfilled a useful purpose in pointing out these relative proportions. It would be very odd, he suggested, if in that large volume there were not still many cubic miles left of acessible minerals. In the case of coal, man probably needs enough to tide him over until atomic energy is the source of fuel, heat and power, and then a supply to provide him only with a coking reserve. Meanwhile, Tizard recognised that the possibility of a shortage of certain essential minerals within a few decades must be faced.

Substitutes for Metals

A large number of workers have pointed out that this is notably true of the elements copper, tin, lead and mercury, which are in danger of early absolute exhaustion.[3] Here there must clearly be an immediate search for substitutes as well as efforts at conservation and re-utilisation. It is obvious from the varying rarity and modes of occurrence of elements that, in terms of social needs, it is not necessary to consider the salvage of all elements but only of particular ones.

Some elements are common and found in virtually unlimited deposits of high concentration. These include calcium and silicon in the earth, sodium and chlorine in sea-water, nitrogen and oxygen in the atmosphere. These need not be considered. A further group are abundant elements which are found in high concentration in relatively limited deposits. This group includes iron, aluminium, magnesium, phosphorus and sulphur. Here the danger arises from the need to go to ever poorer sources with a rise in cost of extraction.

Assessed in this way, the six elements which prove to be most important are carbon, sulphur, phosphorus, iron, tin and lead. Of these, carbon is unique in that its importance is mainly as a source of energy. Thus, the development of industrial atomic energy might reduce the importance of carbon in this list. In any case, the problem is one concerned with greater efficiency in use, rather than chemical salvage. The pooling of heat and power supplies between adjacent undertakings or even whole groups of undertakings would very greatly increase thermal efficiency in industry and help conserve carbon.

Some data are available on the extent of wastage of sulphur, but in general estimates of material which might be recovered—either as elements or compounds—are lacking. Sulphur contained in the annual output of British coal amounts to about 3 million tons, but only about 100,000 tons are recovered. In respect of paper, the Waste Paper Recovery Association makes analyses of the tonnage conserved in this country and the amount collected for salvage, but the discrepancy here is due to failure to collect the used paper and is not a chemical problem.

Under the auspices of the Board of Trade, there exists a National Industrial Salvage and Recovery Council, which has been unable to give estimates of the scope of possibilities in Britain. Data appear to be available only where recovery is currently being practised. For instance, Bradford Sewage Committee reports that from that city's very specialised effluent (from wool-cleaning) they recovered and sold grease to the value of £238,158 and fertiliser worth £22,158 last year alone. Over the past 42 years Bradford has received more than £3½ million for these products.

On the other hand, the sulphite mills of the world, treating timber to convert it into paper, have been estimated to run to waste half-a-million tons of sugar and 1¼ million tons of lignin annually. The mixed pentoses and hexoses of which these sugars consist are capable of producing food yeast. By the end of 1944 the Germans were producing 16,000 tons per annum of food yeast in 12 factories, using wood sugars in sulphite waste liquor as substrates in many of the cases. Hydrolysed wood was used in the others. In Sweden the pink fat yeast *Rhodotorula gracilis* produces from sugars a fat resembling palm oil, with quite high efficiency.

Preventable Waste

In most industries, a great deal of preventable waste still goes on and, like other sicknesses, this one needs immediate first-aid, then medium-term and long-term courses of treatment. This article is not intended to consider the question of looking for fresh sources or the finding of substitutes, but to suggest examples and possibilities of working up waste material, conserving and recovering the scarce, and the refining of crude materials to give more valuable products. All this is essentially short-range work.

Among the materials which are stated to have been recovered from industrial effluents in pre-war Germany[4] are oils, fats, animal feeding stuffs and digestible albumen. Of course, the special circumstances of pre-war Germany must be taken into account and these methods might not be economic under present-day conditions, although they merit careful consideration. A pertinent point is that many of the salvage schemes in pre-war and war-time Germany and in war-time Britain were economic only because voluntary labour was used in its collection. This cannot, of course, be made the basis of ordinary practice. The processes to be described show good possibilities of use on an ordinary industrial basis.

Treatment of discharge water from industrial processes often gives useful results. In all industrialised countries, stringent laws limit the amount of impurity permitted in effluents. In the effort to turn a necessary expense into a good investment, many industries have carried out or sponsored large chemical and biochemical investigations. The two main ways of turning legal necessity into financial virtues as far as water treatment is concerned, are to make the use of water cyclic or to recover saleable by-products. In some particularly happy conditions both features may be present. Since industrial water represents an appreciable expense, the re-use of waste water is a valuable chemical salvage activity.

Prominent in this work in Britain is the Water Pollution Research Laboratory, which has developed several such processes.[7] What has been described as the most spectacular example of re-use of liquors is the system developed for the beet sugar industry. Process water from the screens and presses of a sugar factory contain plant materials and particles of soil in suspension, as well as sugar and other constituents in solution.

Re-use of Process Water

At British factories the process water is now re-used. The waste water is screened and passed through a small settling tank. It is then pumped back and mixed with a proportion of fresh water and the mixed waters re-used.[8] In factories at which screening is efficient the plant can be operated throughout a sugar "campaign" without discharging process water. In general, the re-use of process water appears to have no adverse effect on the yield of saleable products.

Similarly, in the flax industry a cyclic process has been developed.[7] In order to separate the fibres from the stem of the flax plant, the straw is first retted to loosen them, before mechanical treatment. Bundles of flax are submerged in water until eventually the softer tissues of the stems are attacked and partially decomposed by the activity of bacteria.

The previous process, developed on the Continent, was based on the use of anaerobic bacteria, yielding a mixture of foul-smelling waste waters with a *p*H between 4.5 and 5.5. Typical samples were about six times as strong as domestic sewage. An aerobic process was developed in Britain which gives a more manageable effluent and, while the latter is not sufficiently pure for discharge to a stream, it can be returned continuously to the retting tank without seriously interfering with the process of retting.

At the end of a two- to three-day ret with continuous aeration, liquor is returned by gravity from the retting tank for the next ret. From this process there is no discharge of waste waters during the retting season. At the end of the season the liquor in the tanks is disposed of by spraying it over as large an area of land as possible.

Electrolytic Recovery

Processes in which a by-product is recovered may or may not be cyclic in character. In the pickling of metals, waste liquors may comprise spent pickle liquor and waste washing waters. Copper is usually pickled in sulphuric acid and the discharge of excessive amounts of the waste liquors from this process seriously inhibits biological activity applied in sewage purification. Fortunately, they are considered the easiest effluents to treat successfully. Electrolysis in the pickling vat itself, or in a central plant to which the liquor is pumped continuously, recovers the copper and regenerates the sulphuric acid.[7] Applied with great success at a number of copper mills in Great Britain, it gives the further advantages of permitting a high and steady rate of pickling to be maintained.

(To be concluded)

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THE DEVELOPMENT OF ULTRASONICS

Basic Principles and Some Promising Uses

by B. E. NOLTINGK, Ph.D., A.Inst.P.*

ULTRASONICS is defined as the science of vibrations having a frequency higher than can be heard by the human ear. Various experiments have been made in this field for 20 or 30 years, but, at the present time, wider possibilities are opening up, largely as a result of improvements in corresponding electronic techniques, which make it possible to generate ultrasonics at high intensities and more conveniently.

Sound can be pictured either as a pressure wave in which alternate high and low pressures follow each other, or as a longitudinal movement of the elements of volume in the medium traversed. The more familiar airborne sound has a frequency range covering 30 c/s up to 15 kc/s. The human threshold is in the region of 3×10^{-15} W/cm^2 while even 20 ft. away from a noisy motorcycle the intensity is only of the order of 10^{-5} W/cm^2. With ultrasonic generators that are commonly available, this figure can be exceeded by a factor of a million and more.

Transmission of Energy

Sound waves, are not, of course, passed through a vacuum; they can pass through a liquid or solid, but if an attempt is made to transmit such waves through a gas to either a solid or a liquid only a very minute fraction of the original energy is propagated forwards. This is because the transmission of energy is associated both with movement and with force—both with strain and stress and hence a considerable difference will exist between highly compressible air and nearly incompressible water. In the one instance there is a relatively large strain and small stress and in the other it is the reverse.

The position is analogous in some respects to the transmission of electrical energy when there are many amps. and few volts, or *vice versa*. In fact, the term " impedance " is used in both connections; acoustically speaking, impedance is defined as the product of density and the velocity of sound in the medium. When a sound wave reaches the interface between two media, if there is a mismatch a large force may be applied, but not over a sufficient length to communicate appreciable energy. The reverse may occur, when the movement is adequate but the force too small. Thus the energy cannot be passed from one medium to the other, neither can it be annihilated, and since it has arrived at the boundary, it must be reflected backwards.

This aspect may appear to have been unduly emphasised, but it has important practical consequences in the application of ultrasonics, because it means that a fairly sharp distinction can be drawn, according to whether the energy is to be generated and used in gases, or in liquids and solids. The generators for the two uses are normally quite different.

To generate vibrations in a gas it is, of course, possible to start with a moving solid body, but the solid body will need to move a considerable distance in order to pass on high power to the medium. Hence there is some advantage in first generating the vibrations directly in the gas. This can be done by means of a siren, which is probably the most frequently used type of generator. Several applications have been reported for ultrasonics in gases.

Coagulation of Aerosols

Coagulation of aerosols has been attempted on a large scale, though the mode of action of this is not fully understood. Part of the explanation is that particles, suspended in a sound field in a fluid, participate in the vibrational movement of the fluid to an extent that depends upon their size. There is, therefore, an increased probability of collision between particles of different diameters, and the effect is cumulative, ultimately leading to widespread coagulation.

Broadly speaking, this technique is successful when applied to confined spaces such as smoke stacks. It is not an economical possibility in the open air, where an increased effect due to standing waves cannot occur. At 20 kc/s the absorption of air is such that a beam will drop to half its intensity in about 50 yards.

Turning to the generation of ultrasonics in liquids and solids, the subject can be again divided into low power applications when signalling, for gaining information and high power applications for treatment

* Of Mullard Electronic Research Laboratories, in a paper presented at the Engineering Centre, Glasgow, May 11, 1950, of which this is an abstract.

purposes, for producing permanent effects. The obvious way to generate ultrasonics in a liquid is by making a solid body vibrate and the effect can be increased considerably by making use of the phenomenon of resonance.

Comparatively small bodies are needed to generate high frequencies because, broadly speaking, resonant frequency varies inversely with the size of the body. The problem of driving the small solid then arises: it is impossible to connect it to any conventional mechanical apparatus without unduly increasing the overall size. This compels the use of phenomena by which energy can be converted from an electrical to a mechanical form within the vibrating body itself.

The best known of such phenomena is that of piezo-electricity, in which certain crystals, such as quartz, are altered in shape by application of an electric potential across them. Many ultrasonic generators have been built using quartz elements.

A new material recently suggested for this purpose is barium titanate, a ceramic which shows properties akin to piezo electricity after it has been electrostatically polarised. It is too early to assess the relative merits of the old and newer materials. For lower frequencies, magnetostriction is used, *viz.*, the fact that certain metals change shape under a magnetic field.

The electrical apparatus merely provides electrical energy at the appropriate frequency to drive the "transducer" element, which will convert it into acoustic energy. The generator must be suitably matched in impedance. The impedance of piezo-electric devices, however, falls off rapidly as their resonant frequency is increased. It is thus much simpler to match a 2 Mc/s crystal than one for 1/4 Mc/s.

Echo Sounding

Underwater marine devices probably represent the largest single application of ultrasonics. Echo sounding and the location of fish shoals are also commonly accepted techniques, and depend upon picking up an ultrasonic signal from the foreign body concerned.

A sound is attenuated in air several hundred times more rapidly than in water, so it is possible to "see" by means of ultrasonics a very long distance through water. Similarly, in steel, X-rays can penetrate only a few inches, but ultrasonics can pass quite readily through several feet, and in examining steel for flaws the same principle is used as when examining sea water for fish.

In optics, the information derived from an incoming signal can be a composite picture for which rectilinear propagation is necessary—or a measure of the refractive index of the medium examined. Similarly, in acoustics there are analogues of these processes, and the velocity or absorption of sound in the medium can be measured. The former principle has been put to practical use in an instrument for measuring the quality of concrete, which is found to correlate well with the velocity of sound in it. The second principle has been incorporated in a device for determining the amount of solid suspended in a liquid.

Heating Effect

To high power applications of ultrasonics there are no optical analogues. The reasons for the various effects produced differ from case to case. There is, for instance, a considerable heating effect associated with the absorption of vibrational energy in any medium. There are also very large accelerations following from the high frequency movements of the elements of volume. For instance, the water particles excited in a tank by a commercial generator operating at 1 Mc/s can accelerate some 400,000 times faster than if they were falling freely under gravity. Both these effects sometimes produce permanent changes in the material being treated.

Another phenomenon responsible for many of the effects observed is that of cavitation. This may be pictured simply as minute gas nuclei expanding and contracting under the influence of the alternating pressure. The hydro-dynamics of the problem is such that the collapse is much more violent than the growth and it appears that very high pressures and velocities and, perhaps, very high temperatures and electrical discharges all occur.

While the details are still obscure, some experiments have been made with hydraulic apparatus in which the broad outlines of the picture have been confirmed. There is considerable evidence that in ultrasonics the intensity of cavitation is likely to increase as the frequency is reduced. A large number of minute bubbles can be pictured as collapsing on any surface which is immersed in a liquid subjected to such vibrations, and this results in a progressive erosion of the surface unless it is of a very resistant material.

Most metallurgical applications of ultrasonics probably depend on cavitation, since they are effects of breaking up one mater-

ial in another. A great refinement of the grain has been brought about by submitting melts to the action of intense vibrations during solidification. Another application which holds promise of great usefulness is in the soldering of aluminium. The oxide skin can be torn off under the action of ultrasonics, so allowing molten solder to alloy with the metal underneath.

The emulsifying of one liquid into another, which is frequently observed, also has its origin in cavitation. This may have commercial attractions when the conventional ways of emulsifying cannot be used.

Dispersion of solid particles in liquids may also be brought about, and there is some evidence that carbon is readily dispersed, a fact which suggests that specialised laundering techniques may become possible. Instead of dispersion a coagulation occasionally results, similar to that found with aerosols.

Several chemical effects reported such as depolymerisation or the break-up of benzine. The general tendency is towards oxidation. It has been suggested that the only primary effect of ultrasonics is that hydrogen peroxide is produced from water vapour during cavitation. Most chemical reactions of that kind occur only very slowly and are therefore less attractive commercially, unless only traces of the new products are required. This field is, in general, still at the fundamental research stage.

Many biological effects have been closely studied. Bacteria are found to be destroyed roughly logarithmically with time. This is probably another cavitation effect. It may be that the bacterial membrane is ruptured by the pressure difference across it. The destruction is not instantaneous and is dependent on the medium in which the organisms are suspended. Commercial applications are likely to be specialised, such as the production of antigens or the sterilisation of substances for which conventional methods are not available.

In higher forms of life there are also effects possibly due to the heating of tissue or to cavitation in the body cells. Small fish, for instance, can be killed by irradiation for a few seconds. A sharp pain can also be brought about from high power ultrasonics in the human body but definite evidence has been found of the beneficial therapeutic value of lower intensities—perhaps from a massaging effect, leading to an increased flow of blood through the capillaries. Little success has been found in the treatment of cancer or of lung complaints, but sciatica, lumbago and abscesses are all said to respond well to ultrasonic treatment. It seems probable that within a few years this will become a recognised and widely used accessory to other forms of treatment.

U.S. Sulphur Resources—Concern Over Dwindling Reserves

THE increased interest in American national defence has lent new urgency to the inquiry into American sulphur resources, on account of the widespread uses of sulphur and sulphuric acid in explosives and rubber, etc. The principal sources of natural sulphur at present are Texas and Louisiana, which supply 79 per cent and nearly 21 per cent of the total output respectively. Since a U.S. Bureau of Mines estimate in 1944 that these deposits provided a reserve of 80 million tons, about 25 million tons have been extracted, leaving a known reserve of 55 million tons. At the present rate of consumption it is estimated that this reserve might last only 11 years. In face of eventual depletion, therefore, the sulphur industry in America is conducting a search for untapped deposits of sulphur, both in America and abroad. While this is being done, secondary sources of supply are being investigated, the possibilities of fuller yields of sulphur from pyrites and from oil refinery gases will be achieved. A further supply of sulphur and sulphuric acid is obtained from smelter gases. It is the belief of the American sulphur industry that, by developing these and similar methods, a reserve stock of 120 million tons could be built up.

Laminated Glass Fibre Tubes

Development of a new glass-fibre tube and pipe material, designed as a replacement for steel and other critical war metals in many commercial applications is announced by United States Plywood Corporation, New York. The new product, Glasweld, is said to have the strength of steel and is rust and corrosion proof. It is now available in the oil and chemical processing industry. It is a laminated material in which glass fibres in the form of cloth or tape are bonded with resins to develop a tube impervious to extreme heat, chemical action and shock It has marked acid resistance.

Technical Publications

REFLECTING broadened interest in the international status of minerals, a new edition of Minerals Yearbook, authoritative source of information on domestic and foreign mineral commodities compiled annually by the Bureau of Mines, has been increased to 1626 pages. The new issue's extensive economic and statistical data review the production, distribution and consumption of all mineral commodities, including fuels. Bound copies of the yearbook ($4.25) can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. All chapters are also available as reprints.

* * *

DENSITOMETRIC measurements by means of a logarithmic potentiometer are described by J. A. Hall, A.R.C.S., B.Sc., D.I.C. (National Physical Laboratory), in "Technique" (Vol. 4, No. 3) published by Muirhead and Co., Ltd., Beckenham, Kent. Another article describes developments in the application of tuning forks to scientific purposes.

* * *

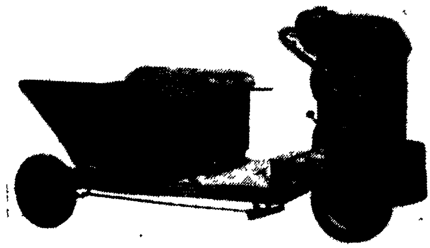
TANNING, its early history, the colouring of leather, and preservation of skins, form the subject of the illustrated article in the August issue (No. 81) of the "Ciba Review," published by Ciba, Ltd., Basle, Switzerland. The next number in October will be devoted to water, its occurrence and nature, treatment for trade and industrial uses, purification of waste waters, and municipal supplies past and present.

* * *

THE importance of securing fixed quantities of impurities in iron samples required for specific metallurgical tests has received attention by J. D. Fast (Eindhoven), whose contribution in the current Philips Research Reports (4, 5) describes in detail a high-frequency melting apparatus for preparing such special alloys. The method is based on the preparation in the first place of carbonyl iron samples of very high purity by high frequency melting *in vacuo* or under pure argon.

* * *

WATER pollution abstracts published monthly by the DSIR give a summary of recent literature on the subject. The latest abstracts available are December 1949 (Vol. 22, No. 12, Nos. 1422-1530) and January 1950 (Vol. 23, No. 1, Nos. 1-120).



[By courtesy of Wessex Industries (Poole), Ltd.

A 3 h.p. tipping truck, manually controlled, the body of which can be interchanged with a platform assembly

USES and methods of applying a low-temperature-melting alloy which expands slightly on solidification are described in a fully illustrated manual obtainable from Mining and Chemical Products, Ltd., London. Known as Cerromatrix, the alloy is composed of bismuth, lead, tin and antimony, and has a wide range of industrial applications.

* * *

AS a means of accurately controlling small amounts of reagents fed to pilot plant flotation machines an electrolytic feeder has been developed in the New Jersey Zinc Company laboratories. The apparatus is described in "Deco Trefoil" (Vol. 14, No. 4), journal of the Denver Equipment Co., Denver, Colorado, U.S.A.

Specialist Library Services

BRISTOL University will be host from Friday, September 22 to Monday, September 25, to the 25th annual conference of Aslib, whose president, Dr. Percy Dunsheath, last year accused the Government of failing to recognise the value to the country of an efficient library in the field of science and technology, and advocated the establishment of such a library five times as large as the existing Patent Office Library in London.

Aslib, which is this year primarily concerned with the organisation of specialist scientific and technical knowledge in the service of British industry, is conducting a vigorous campaign to ensure that the fullest possible use is made of all published technical information.

The Chemist's Bookshelf

CHEMICAL INDEX OF MINERALS. M. H. Hey. 1950, London: British Museum. Pp. xx + 609. 30s.

Many books exist for the purpose of identifying minerals by their physical properties and by blowpipe tests, but until now there has been no complete work dealing with minerals arranged according to their chemical composition. For this reason the index of mineral species, which was originally begun as a card system in 1942 to meet a practical need in the Department of Mineralogy and is now published by the British Museum, should be most welcome.

The book is divided into two parts, the chemical index (286 pages) and the alphabetical index (318 pages). The general principle has been to subdivide the chemical section by anions and to group similar combinations of anions together. There is, for example, a section " Borates " and, next to it, " Borates with other Anions." Likewise, silicate minerals fall into four categories: " Silicates of Aluminium," " Silicates not containing Aluminium," " Silicates of Aluminium and other Metals (Alumino-silicates)," and " Silicates and Alumino-silicates with other Anions."

The alphabetical index is arranged in three columns. In the first column appear the names of the minerals, heavy type being used to distinguish accepted names from synonyms, colour and " trivial " varieties, pseudomorphs and group names, which are printed in ordinary type. The second column gives a literature reference and the third column contains an annotation upon the name of the mineral. In the case of " trivial " varieties for example, the name of the parent species appears, introduced by " Var. of." For accepted names of species and chemically distinct varieties the third column contains the reference number used in the chemical index, the name of the author and date of introduction of the name, and, where the original spelling differs from that commonly accepted it is appended in parenthesis.

The work involved in this index must have been prodigious. The author has been to considerable trouble to apportion his classification by study of the literature and careful criticism of chemical analyses and formulæ in the light of recent X-ray studies.

To chemists, geologists, and all those who study minerals, this work is highly commended. No library is complete without it.—P.M.

ERNAEHRUNGSFORSCHUNG UND ZUKUENFTIGE LEBENSMITTELCHEMIE. Kurt Täufel. Berlin: Akademie-Verlag. 1950. Pp. 30. Dm.3.50.

Food chemistry today tends towards the view that foodstuffs in general are mostly very complicated mixtures whose composition is only partly known. Accurate analyses meet with great difficulties and therefore it is considered sufficient to summarise similar components such as nitrogenous substances, ether-extract, acid-titration, etc. The principal consideration, however, remains the nutrition value. One gets nearer the essence of a foodstuff when looking at it not only as a mixture, but as a biologically organised system. In this perspective, the present publication deals with foodstuffs deliberately as physiological substances, with physiological and non-physiological changes, with model research methods, with the aims of food analysis, the problems of food technology as well as normal and abnormal foodstuffs. These headings lead, so to speak, to functional food chemistry and point the way to future research principles.

Book Received

SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE. Volume 4. W. Theilheimer. 1950. Basle: S. Karger, A.G., Verlag. London: Inter-Science Publishers, Ltd.

Erratum

In last week's "Chemist's Bookshelf" the title of "The Chemistry of the Acetylene Compounds. Vol. 2, The Acetylene Acids" should instead have been "The Chemistry of the Acetylenic Compounds. Vol. 2, The Acetylenic Acids".

£80 More for Lactic Casein

As from September 4, the prices of Government stocks of lactic casein have been increased by £80, to between £200 and £215 a metric ton.

OVERSEAS CHEMISTRY AND INDUSTRY

WORLD POTASH SUPPLIES

Important Contributions of France and U.S.A.

WORLD production of potash (K_2O) in 1918 was about 1.2 million, in 1938 3 million and in 1949 4 million tons. Principal contributors to the last total (in 1000 tons) were West Germany 750, France 890, Spain 170, U.S.A. 952, and Russia, E. Germany and Poland (as a very rough estimate) 1400. Germany's share of world production in 1918 was 96.2 per cent, and in 1938 56.8 per cent. Post-war output in West Germany has increased from 285,000 tons in 1946 (excluding the French zone) to 750,000 tons in 1949 including that zone; and in 1950 it is estimated it will reach 900,000 tons. (Carl Liesegang, *Chem. Ind.* Aug. 1950, 405-8.)

With the return of Alsace-Lorraine, France became second (after the U.S.A.) among the principal producers in 1949. The mines are state-controlled as Mines Dominiales, except the Mines de Kali Sainte Therèse. A Franco-German agreement in 1926 settled various matters of division and working. More than half of the 1949 output was used in France and her colonies, and the remainder (410,000 tons K_2O) was exported.

Many new shafts have been sunk in France, and it is planned still further to increase output, to 950,000 tons in 1952, and 1.2 million tons in 1957. Potash salts have also been found in other parts of France, notably in the Landes and Basses Pyrénées areas, especially sylvinite, and a State-controlled company, Soc. des Mines de Potasse et Magnésie, was formed to exploit them. Results so far, however, appear to have been relatively small.

U.S. Production

The remarkable increase of potash production in the U.S.A. is well known. Some deposits in Canada (Saskatchewan) are also known, but the position is somewhat different in the case of Russia and Poland. In the former, substantial deposits have been found in many localities, first in the western Urals in 1916-17, at Solikamsk on the river Ussolka, and other places, both carnalite and sylvinite, to the extent of several milliard tons. Subsequently, through geological and geophysical exploration, deposits were found at other places, e.g., between the lower Volga and Caspian Sea, south of Sarotow near Osinski, between the southern Urals and the Emba, including both sylvinite and sulphate salts.

Some of these were thought to be extensions southward of the Solikamsk deposits, but with higher K_2O content. In Central Asia also, south of the Aral Lake (Buchara) on the borders of Afghanistan, potash salts are said to exist, but little seems to be known of these. Estimates of Russian pre-war (1938) potash output varies from 360,000 to 400,000 tons.

In Poland, the new territory added since the war has largely increased the potash resources of that country, including more particularly those of Galicia, though much is under Russian control. No recent figures are available. Before the war production of potash in Poland was on the up grade and had reached about 108,000 tons in 1938.

Spanish Deposits

In Spain, potash discoveries were made in 1912 in the north-east, near Cardona about 50 miles north-west of Barcelona, including carnallite (10 per cent K_2O) and sylvinite (14-23 per cent K_2O). Reserves were estimated at 500 million tons K_2O.

Production of potash in Spain rose from 2770 tons in 1925 to 131,684 tons in 1934, and, after some decline during the Civil War, reached 153,800 tons in 1947. In 1935 Spain became a partner in the international (Franco-German) agreement with a 15 per cent share in the export trade. Most of the output was exported, despite the demands of Spanish agriculture, and amounted in 1947 to 104,000 tons. The relatively high quality of the deposits and their proximity to the coast should have favoured development, but certain difficulties were encountered, including lack of adequate water supplies. However, it is hoped that this year output will reach 200,000 tons and in 1952 250,000 tons (K_2O), with more than two-thirds for export. A new find was made in 1948 at Igunatal near Santander, probably connected with the Ebro deposits.

The Dead Sea resources in this mineral have been estimated at 40-50 million tons (K_2O). Most of the export hitherto has been to England, but the policy of the Israel government is apparently to alter this and divert the export trade to Africa, the Middle East and the South Pacific.

GROWTH OF POLISH CHEMICAL INDUSTRIES

Progress Towards Self-Sufficiency

THE chemical industry in Poland appears to have made great progress in the past few years and ambitious plans are announced for the future under the six-year plan which begins this year. In 1948 capital investment (including State funds) was raised to Zl. 7.8 milliard, and was still larger in 1949. Pre-war capacity in many sections has been greatly exceeded, especially in heavy chemicals, pharmaceuticals and fertilisers.

New works have been built and older ones modernised. More than 25 modern factories have already been completed, employing about 22,000 people. Plastics, textile chemicals, insecticides, and many other products are sharing in this advance, states a report by Dr. A. Metzner, of Frankfurt-on-Main (*Chem. Ind.*, August, 1950, 408-411).

Soda production, formerly in the hands of Solvay-Werke, reached 190,000 tons of ash and 47,000 tons of caustic soda in 1948, and last year was 228,000 and 57,000 tons respectively. The 1950 monthly output has so far averaged about 10 per cent more.

Insufficient Acid

Sulphuric acid is still in short supply despite serious efforts to attain and pass the pre-war output. The position would be still worse had not the factories of Silesia added a substantial quota to existing supplies. The real cause of the persistent shortage is a lack of raw material, notably zinc ores and pyrites. In 1938 sulphuric acid production was 314,000 tons; in 1948, 221,000 tons; in 1949, 278,000 tons. By 1955 it is planned to increase it to 400,000 tons to cover the anticipated home demand, using as additional raw material the large native resources of gypsum. (Presumably the combined cement/acid process is here referred to, states Dr. Metzner, though nothing is said about cement). The aid of East German chemists may be enlisted in this project.

One of the effects of the shortage of sulphuric acid is that the output of superphosphate in 1949 was only about half the capacity total of nearly 80,000 tons. The average monthly output in 1950 so far is up by about 18 per cent, and at this rate is estimated at 470,000 tons for the whole year. Crude phosphate is mostly obtained from Russia. Almost complete independence of imports has been achieved in potash. Control of the valuable deposits in East Galicia, however, is now in Russian hands.

Fertiliser consumption in Poland is to be heavily increased, and at the end of the six-year plan should be per hectare: 12 kilos N, 15 kilos P_2O_5, and 5-6 kilos K_2O, about five times as much as pre-war. Two new synthetic nitrogen works are under construction and should bring the total nitrogen to 202,000 tons, or, including ammonium sulphate from gas works, 220,000 tons.

Sodium Products

In 1938 salt production in Poland was 566,900 tons, and the relatively newly found deposits around Posen, together with the bituminous coal there, should create a new centre of chemical industry in that district.

In the electrochemical field special attention has been given to the electrolysis of brine and the production of ferrous alloys. Conditions for the economic production of caustic soda by electrolysis in Poland are favourable, both electric power and salt being plentiful and cheap. The question whether the old Siemens-Billiter process will be used or replaced by newer methods has not yet been wholly settled, although it has been decided in any case to install at least one new mercury-electrolysis plant with a daily capacity of 20-30 tons Cl, ensuring also pure caustic for the artificial silk industry.

Before the war Poland imported large quantities of coal tar products, but now, with the help of the additional Silesian coke ovens and tar distilleries, and increasing capacity in other parts of the country, considerable progress is being made towards self-sufficiency. Benzol, toluol, cresol, phenol and naphthalene are already on the export list. Later, these are expected to be used more at home and the export of finer derivatives to increase. Coke production has more than doubled since before the war. In 1949 it was 5.7 million tons. Twenty coke ovens are now in full operation, producing a nearly complete range of by-products.

There is a large demand in Poland for coal-tar types for a correspondingly large and expanding textile industry. Production in 1949 at 8700 tons was nearly double that of 1938, but considerable quantities of dyes and intermediates must still be imported.

IMPROVED GERMAN CHEMICAL TRADE

Satisfaction at Recent Agreement with Britain

INSTEAD of the usual seasonal calm, chemical manufacturers in Western Germany during August experienced a marked improvement in the receipt of orders, especially for products likely to be affected by higher commodity prices in the world market. A revival of buying interest has also been noted on the part of foreign customers, who evidently wish to add to their stocks.

Of recent trade negotiations those with Great Britain were the most important ones from the German point of view. Satisfaction is expressed at the fact that the Western zone is to be treated as a "soft currency country," and it is hoped that exports from this area to other sterling territories, notably South Africa, Australia and India, will benefit from this.

Two other recent trade agreements are likely to prove beneficial for the West German chemical industry. The trade and payments agreement with Brazil provides for shipment of U.S. $13.8 million worth of chemicals, from the zone, including aniline dyes valued at $2.5 million, drugs and pharmaceutical preparations, $2 million, and potassium chloride, $600,000.

The commercial treaty with Italy provides for West German deliveries of dyestuff intermediates worth $300,000, solvents $450,000, textile auxiliary products $150,000, other chemicals $500,000, medicinal specialities $1 million, and pharmaceutical preparations $500,000. Further deliveries include intermediates for the manufacture of pharmaceuticals, $200,000, synthetic dyes, $2 million, synthetic wax $150,000 and chemical machinery $800,000. Italian products supplied in return include tanning materials $730,000, sulphur $500,000, talcum $200,000, bauxite $200,000, and other chemicals $400,000.

Trade with South America

Trade negotiations now in progress with Chile are expected to result in a resumption of Chile saltpetre shipments to Germany.

Home market sales of chemical fertilisers in the 1949/50 agricultural year have been disappointing. The consumption of nitrogenous fertilisers was 9 per cent and that of phosphatic fertilisers 13 per cent below the pre-war level. Compared with 1948/49, only the consumption of potash salts has increased to any noticeable extent. The disappointing home demand is attributed chiefly to high taxation and marketing difficulties for certain kinds of farm produce subject to import competition, but farmers in Western Germany seem to be rather doubtful about the economic value of heavy fertilising in the present uncertain situation.

To offer an attraction to consumers, the nitrogen industry is now granting special price reductions for early acceptance of delivery. The export quota of 50,000 tons of pure nitrogen was fully utilised in the first half of 1950 when Holland, Spain and Egypt were the best foreign markets. In 1950/51 between 120,000 and 150,000 tons of pure nitrogen may be available for export. The West German nitrogen capacity, it is stated, is far from being fully utilised at present, and an increase in home and foreign sales would therefore not meet with any difficulties on the production side.

Potash Production

Figures for the production year which ended in June, 1950, show that the potash industry of the zone exceeded its output target. About 8.15 million tons of potash salts were mined in the 12 potash mines on Federal territory, and the potash fertilisers produced from them had a K_2O content of 786,000 tons. Including crude salts sold directly to agriculture, the total production in 1949/50 may be put at 840,000 tons (K_2O), compared with 630,000 tons in 1948/49 and 450,000 tons in 1947/48. Exports in 1949/50 increased to 235,000 tons (K_2O) compared with 60,000 tons in 1948/49 and 30,000 tons in 1947/48. The Scandinavian States, the Benelux countries and Great Britain were the principal buyers. Japan had also emerged as an important consumer of German potash salts, and substantial tonnages were shipped to North and South America. In the current fertiliser year—1950/51—shipments abroad have started at a substantially higher rate than last year, despite the falling-off of production in the April-June quarter.

The West German soap industry which has for some time been suffering from an appreciable contraction of consumers' demand has lately been able to clear its surplus stocks. Some producers of popular brands have had to stipulate extended delivery terms. Prices, however, are still under pressure because of heavy competition.

YUGOSLAVIA'S OIL

New Production and Development

YUGOSLAVIA is reported to have succeeded in entering the ranks of Europe's commercial oil producers. Output in 1949 amounted to some 340,000 tons, equal to 100.8 per cent of the planned figure, and to 75.5 per cent of the total of 450,000 tons aimed at for the last year (1951) of the current five-year plan. Output for the current year is confidently expected to reach 410,850 tons.

The importance of what is being achieved is illustrated by the fact that in 1939 output amounted only to 1000 tons produced by the Medjimursko Petrolejstvo Drustvo (in which Swiss capital participated) from the Donja Lendava field, near the frontier with Hungary. This remarkable increase is due principally to the progressive development of the Donja Lendava field. A substantial supplementary supply is likely to come from Northern Croatia. There is very active prospecting there and elsewhere.

The enterprise represented by the Yugoslav progress is emphasised by the facts that there was before the war no home production of drilling or refining equipment, the Germans denuded the country and Russia has failed to honour her undertakings to supply what was needed—25 sets of drilling equipment, of which only five incomplete ones were provided. By the beginning of this year, ten complete sets of drilling equipment had been made within the country as a result of co-operation between a number of firms and. more recently, it was decided to establish a plant for the manufacture of drilling equipment only.

The expectation of equipment and pipes from the U.S.A., financed by part of a current $20 million credit, and of oil drilling equipment from this country, Yugoslavia should be able in future to keep fully occupied the two important refineries at Rijeka (Fiume) with a capacity of 850,000 bbs.p.a., and former Shell plant at Sisak (600,000 bbs.p.a.) which has meanwhile been considerably expanded. The capacity of the new refinery in Sumecani in the Gojlo area (north-east of Ivanic Grad) is not stated.

Oils and Fats Prices Unchanged

The Ministry of Food announces that no change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four-week period ending September 30.

NEW RAYON PULPS

Likely Alternatives in India

CERTAIN varieties of bamboo, reeds, bagasse and jute fibres yield high grade pulps with high alpha-cellulose content.

A detailed investigation into the preparation and properties of pulps from the raw materials with respect to their suitability for rayon manufacture has been completed in the Cotton Technological Laboratory in Bombay. The recently published results of this investigation indicate that cellulose esters prepared by the action of glacial acetic acid and acetic anhydride on these pulps have also been tested for their suitability in the manufacture of cellulose films.

The products obtained from bamboo reeds and bagasse have an alpha-cellulose content of over 85 per cent and an ash content varying from 0.2 to 0.3 per cent. This meets the requirements of pulps suitable for rayon manufacture.

Bagasse pulp viscose for rayon takes seven days to mature, whereas viscose obtained from other pulps matures in four days. Bagasse pulps are said to require the minimum amount of carbon disulphide (48 to 70 per cent), whereas some others require over 90 per cent of the weight of pulp.

The experimental data published indicates that pulps from these sources, after a preliminary treatment with caustic soda, are suitable for use in the rayon industry. Pilot plant trials will be required to produce definite conclusions.

Next Week's Events

MONDAY, SEPTEMBER 11

UNESCO

Paris: International Meeting of the Associations for the Advancement of Science. Two days.

Shoe and Leather Fair Society

London: Olympia. Shoe and Leather Fair. Until September 15.

WEDNESDAY, SEPTEMBER 13

Royal Photographic Society of Great Britain

London: 16 Princes Gate, S.W.7. 3 p.m. to 6 p.m. The 95th Annual Exhibition of Photography.

THURSDAY, SEPTEMBER 14

Incorporated Plant Engineers

Newcastle-on-Tyne: Royal Turks Head Hotel, Grey Street. 7.30 p.m. "Metallising for Industrial Plant Maintenance" by J. Barrington Stiles.

OVERSEAS

Another Big Uranium Claim

What is claimed to be a " massive formation " of uranium ore has been found on the banks of the Ferguson river, near Katherine, 200 miles south of Darwin, in the northern territory of Australia.

U.S. Platinum Price Raised

New prices for platinum in the U.S.A. were quoted on August 31 at $90 per oz. retail, and $87 for bulk amount. With this increase of $13 per oz. it was disclosed that platinum was no longer available to the jewellery trade.

25 Per Cent More Cellophane

A sixth Cellophane casting machine is to be installed at the Shawinigan Falls works of Canadian Industries, Ltd., and will increase production of the transparent cellulose film by approximately 25 per cent. This, with other new equipment and additions to existing buildings, will require approximately $1.5 million. The project is expected to be completed early in 1952. More than three-quarters of the Cellophane produced at Shawinigan Falls is used in the Canadian food industry.

Augusto Righi Centenary

To commemorate the centenary of the birth (August 27, 1850) at Bologna, of Augusto Righi, the Italian physicist and a former member of the Royal Society, the Italian Physical Society is holding a congress there from September 15 to 20. Righi's earliest work was on the change of the electrical resistance of bismuth in a magnetic field, and he applied the phenomenon to the measurement of magnetic fields. Among the many honours conferred upon him was the Hughes Medal of the Royal Society.

New Water Soluble Cellulosic

A new water soluble cellulosic, sodium cellulose sulphate, SCS, was introduced by the Tennessee Eastman Corporation, at the National Chemical Exposition, Chicago, Illinois, which opened this week. Made by treating cellulose fibres with sulphuric acid and certain other reagents, the resulting granular product in a 3 per cent solution in water permits the production of a clear, strong, grease-proof, non-burning film. The new cellulose gum is expected to improve the effectiveness of synthetic detergents by holding soil particles in suspension and to be used in water paints, emulsion paints and textile finishing.

Steel and Sulphur for Chile

Production of steel in Chile has been started by the furnaces of the Cia. de Acero del Pacifico at Huachipato. The construction team will be occupied with work on the construction of a new sulphur plant being erected by Follies Brothers in Chuquicamata.

Aluminium Development in Burma

The annual output of Burmese aluminium works now totals 1975 tons of finished goods, compared with 538 tons before the war. There are 60 aluminium factories in Rangoon, employing 838 workers. Government's industrial grant to aluminium works now amounts to Rs. 1 million.

U.S. Plans to Mine Cobalt

Cobalt, vitally necessary for the fabrication of permanent magnets and special high-temperature steel alloys is to be mined by mid-1951 by Howe Sound Company at its Blackbird mine in Idaho, which has been under development for the past several years. At present the United States produces insignficant amounts of cobalt. The bulk of the world's supply comes from the Belgian Congo (75 per cent) and about 15 per cent is produced by Canada and 5 per cent by Northern Rhodesia. The Blackbird mine is expected to provide some 2 million lb. of metallic cobalt yearly. In 1949 the U.S.A. consumed about 4.7 million lb. of cobalt.

Coal Production and Exports

PROVISIONAL figures of the Ministry of Fuel and Power show that the total saleable output of coal last week, including 207,700 tons of opencast coal, was 4,130.300 tons, against 4,065,300 tons in the previous week. Nearly 67,000 tons were lost through holidays last week, against 165,300 in the pevious week. In the 35 weeks of 1950, production has totalled 143,619,700 tons, or 1,833,200 tons more than in the corresponding period last year. Exports in the week ended August 26 were 168,000 tons, against 182,000 tons in the preceding week. In 34 weeks of 1950, 9,480,000 tons of coal have been exported, 1,400,000 tons more than in the same period last year.

PERSONAL

SIR HAROLD HARTLEY, president of the British Association, was awarded an honorary degree of Doctor of Science at Birmingham University on September 2.

DR. C. H. HAMPSHIRE will retire from the secretaryship of the British Pharmacopœia Commission on October 3 and will be succeeded by MR. T. C. DENSTON, at present deputy secretary. Dr. Hampshire will remain as editor of *The Journal of Pharmacy and Pharmacology* and will continue his work on the International Pharmacopœia for World Health Organisation.

MR. FRANK G. ANDREAE, a director of Quickfit & Quartz, Ltd., has retired after 22 years' service with the company. He joined the board in 1935.

MR. C. L. G. FAIRFIELD has been appointed a director of Mullard Equipment, Ltd., with effect from August 1.

The following are among the appointments in the Colonial Service recently announced: MR. W. E. CALTON (government chemist, Zanzibar) to be government chemist, Tanganyika; MR. A. CAWLEY (mining geologist, Nigeria) to be assistant director of geological surveys, Nigeria; MR. A. H. MILLARD (pharmaceutical chemist, Federation of Malaya) to be chief pharmaceutical chemist, Federation of Malaya.

SIR BEN LOCKSPEISER, secretary of the DSIR, will be the principal guest at the third annual dinner of the Birmingham University Chemical Engineering Society on March 14.

DR. KENNETH C. D. HICKMAN, whose ingenuity and leadership made possible the production of vitamins A and E from raw materials formerly considered unusable, has been awarded a John Price Wetherill Medal by The Franklin Institute, of Pennsylvania. Dr. Hickman was born in London in 1896 and graduated from the Royal College of Science in 1916. He received a Doctor's degree in Photographic Chemistry at London in 1925. From 1919 to 1925 he was a lecturer in inorganic chemistry at the Royal College of Science. and then joined the staff at Eastman Kodak in 1925. While working there he became director of research at Distillation Products, Inc., in 1938. He is currently continuing his researches on the theory of free evaporation and is also serving as chemical consultant for Arthur D. Little Company.

LETTER TO THE EDITOR

"Neglected Lime Producers"

SIR,—Mr. Harold Fletcher's letter is purely a statement of the factors which the limestone producers wish to maintain so as to establish and retain a steady market for their product, but this is not the whole picture. Subsidies are justifiable in cases of national emergency, but should be eliminated as soon as possible if a stable economy is to be achieved. Therefore it is well to look at what will be the problem when the subsidy ceases. The farmer must by now know the value of lime, and will continue to use it if the price is not excessive.

There are two factors of importance in reducing price: namely, local production to avoid heavy freight charges, and the use of a coarser-grained product to reduce grinding costs. The authorities are agreed that the degree of fineness stipulated is quite unnecessary, nor is a pure limestone product required; magnesium limestones containing 6 per cent or more of magnesium carbonate and up to 10 per cent of silica are quite suitable and such occur in many widely-scattered places, particularly in Scotland, and by use of these long haulage charges are cut out.

It should be possible to deliver to farmers in most districts ground limestone, fine enough for all purposes, at a unit price about half that obtaining at present, and still leave a profit for the local producer.—Yours faithfully,

B. G. MCLELLAN, F.R.I.C., M.I.Chem.E.,
Chairman, Limestone Group,
Scottish Council,
(Development and Industry).

22 Granby Road,
Edinburgh 9.

Indian Glass Research

FUNDAMENTAL research in the various branches of glass and ceramics manufacture will be conducted at the Central Glass and Ceramic Research Institute, Calcutta, recently opened by the chief minister of West Bengal, Dr. B. C. Roy. This is the fourth in the chain of research centres to be set up by the Government of India. Other functions of the institute will be testing and standardisation, technical assistance to the existing glass and ceramics industry, and dissemination of information and training of technologists for special work. It has equipment for processing and improving raw materials, particularly glass sands.

HOME

Steelworks Fatality

One man was killed and two others injured on August 31 when a fault developed in the mechanism operating the power for a 1200-tons press at Brown, Bayleys, Steelworks, Ltd., Sheffield. Pressure was unexpectedly released and the men were hurled to the ground. Charles Edward Atkinson, of Baltic Road, Sheffield, received extensive head injuries and died almost immediately.

Food and Drink Poisoning

The large increase of food poisoning cases was referred to by Professor G. S. Wilson, director of the Public Health Laboratory Service, speaking last week at a conference on hygiene held in conjunction with the Food Exhibition at Olympia, London. Despite this increase, the professor said, outbreaks due to chemical poisoning in any single year could be counted on the fingers of one hand.

Technical and Scientific Register, 1949

During the year ending December 5, 1949, the Technical and Scientific Register filled 2212 vacancies and had 5310 persons then registered as available, of whom 3886 were already employed but wished a change of work. During the same period 29,217 vacancies were notified by employers to the appointments offices and 13,311 registrants, of whom 7183 were ex-Service men and women, were placed in employment.

Stolen Lead Ingots

At Huddersfield Quarter Sessions last week William Blackburn, aged 44, scrap metal merchant, of Lascelles Hall, Kirkheaton, Huddersfield, a former member of Kirkburton Urban Council and Sunday School superintendent, was sentenced to 12 months' imprisonment for receiving 28 ingots of lead worth £81, the property of the I.C.I., Ltd., Huddersfield, knowing them to have been stolen. Blackburn pleaded "Not guilty."

New Oil Additive from Fawley

A plant recently completed by the Anglo-American Oil Co., Ltd. on the site of the original refinery at Fawley, Southampton, is now producing the heavy-duty additive for lubricating oils containing barium and sulphur, Paranox 56. The British-produced additive will be known as Paranox 56GB to differentiate it from the American product, which was first introduced in the Standard Oil Company of New Jersey's oils in 1940.

$200,000 for U.K. Electric Motors

Mr. W. W. Grainger, of Chicago, one of the leading distributors of electric motors in the U.S.A., has placed an order with Newman Industries, Ltd., Yate, Bristol, for electric motors to the value of $200,000, for shipment as soon as possible.

Corrosion Prevention

The name of Clear Glass Products, Ltd., has been changed to Corrosion, Ltd. For some time past the company has concentrated all its activities on corrosion problems and particular emphasis is now being laid on the use of new materials and new methods in dealing with corrosion. The policy is to produce materials specifically designed to cope with particular problems.

Fluorescent Inks

A Leeds firm has produced a number of coloured inks from fluorescent substances, which are said to be much brighter than natural colours and have the brilliance of neon lights at considerable distances. The inks may prove to be suitable for textile uses.

Spreading Fertiliser by Air

A demonstration of spreading fertiliser from an aeroplane over marginal land inaccessible to agricultural machinery was given near Plynlimon last week. Distribution of phosphate was found to be slightly more concentrated at the centre of the strip covered than at its edges. The width of the strip was 180 ft. from a height of 400 ft.

A.P.V. Company's Move

The transfer of much of the plant of the A.P.V. Co., Ltd., to the new town at Crawley is expected to take five years. By 1952, however, it is hoped that the company's White City works will have been installed at Crawley, together with two foundries. The company has arranged for its 1400 employees to travel to Crawley during September to see the new houses now being built for them.

Danger of Anti-histaminic Drugs

The need for chemists to warn purchasers of the hazardous nature of anti-histamine drugs, was emphasised by the Birkenhead coroner last week. Speaking after recording the accidental death of a child due to Anthisan poisoning, the coroner said that no warning was issued to the mother that an excessive dose was dangerous to an adult, and even a small quantity was dangerous to a child.

The Stock and Chemical Markets

THE announcement that Imperial Chemical Industries is to raise a further £20 million, this time by the private placing of 4 per cent unsecured loan stock with redemption dates of 1958-1960, did not cause any general surprise. The last accounts showed capital commitments of £23 million and no doubt the rising trend of prices has since meant that more money is required to finance stocks and also the cost of expansion and development work.

It may be recalled that in August, 1948, the company raised over £20 million by an issue of ordinary shares to shareholders at 40s. 6d. per share. No doubt shareholders would have been offered participation in the present new issue had it not been for the uncertain conditions in stock markets which have ruled recently. The new issue is purely a private financial operation and is probably the biggest of its kind that has ever taken place.

There will be no Stock Exchange quotation for the new Imperial Chemical loan stock. After falling to 41s. 6d., Imperial Chemical ordinary units have rallied to 42s. 1½d. at the time of writing, the recovery reflecting general confidence that their 10 per cent dividend will be maintained.

I.C.I. is not, of course, the only leading industrial company which has to raise large sums to provide for expansion and the increased cost of financing stocks owing to the higher prices which have been in evidence ever since devaluation of the £ and have tended to show a sharp up-trend following the Korean war. The City expects that Lever & Unilever will have to raise a substantial sum of at least £15 million before long, partly to provide for larger stocks which will have to be carried following the end of soap rationing, and partly because of the extremely keen competition between the big groups manufacturing the new forms of detergents.

It will be recalled that, as already announced, Albright & Wilson is shortly to raise over £2 million by the issue of 5 per cent preference shares at par to shareholders. The market continues to expect that this important financial operation will meet with success, because the clear 5 per cent yield on the new preference shares is attractive and, moreover, there is to be a share bonus of 100 per cent for ordinary shareholders before the end of the year.

Morgan Crucible plans to make an issue of "fixed and equity" stock in the future. Lever & Unilever ordinary units have remained steady at 40s., and Albright & Wilson 5s. ordinary units have further strengthened to 31s. Monsanto 5s. shares kept firm at 49s. 6d., Laporte Chemicals 5s. units were 10s. 6d. and W. J. Bush £1 ordinary rose sharply to 85s. Lawes Chemical were 10s. 3d., Fisons at 26s. 9d. moved in favour of holders, Brotherton strengthened to 20s., Boake Roberts to close on 30s. and F. W. Berk 2s. 6d. shares were 10s. 6d. Amber Chemical 2s. shares were 3s., Bowman Chemical 5s. 3d., Pest Control shares 6s. 9d., L. B. Holliday 4¼ per cent preference 19s. 6d., and Woolley 4½ per cent debentures kept at 104½.

Boots Drug were higher at 49s. 3d., and Beechams deferred good at 13s. 7½d. under the influence of the financial results. Triplex Glass rose further to 27s. United Molasses were higher at 44s. 3d., the 4s. units of the Distillers Co. changed hands around 19s., and Anglo-Iranian, Shell and other leading oil shares have been inclined to move in favour of holders.

Market Reports

QUOTATIONS for industrial chemicals are on a strong basis in almost all sections of the market, the chief price change being a further increase in the quotations for the lead compounds due to the rise in the metal price. The Convention basis price for dry white lead is now £146 per ton and for dry red lead £138 per ton. The overall movement of supplies to the leading domestic users as well as to export outlets has continued to be steady, and pressure for deliveries of some of the routine soda products has been maintained. There is also an active inquiry for contract renewal business. There is a continued good call for most potash compounds, while formaldehyde and hydrogen peroxide are in steady demand. Satisfactory trading conditions are reported on the market for the coal tar products, creosote oil again being in good request for home and export account.

MANCHESTER.—Home trade deliveries for alkalis and other leading heavy chemical products have been made freely on the Manchester market during the past week and conditions seem now to be back almost to pre-holiday level. The number of new inquiries from home users is reported to

(continued on page 378)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.)

CITY GLASS CO., LTD., London, S.W. (M., 9/9/50). Aug. 2, £12,000 bond etc., to trs. of late Baron Inverclyde; charged on two plots of land at Denmark Street, Ashfield Street, and Closeburn Street, Glasgow, with bldgs. thereon. *£23,500. June 28, 1950.

THOMAS KERFOOT & CO., LTD., Ashton-under-Lyne, chemists. (M., 9/9/50). Aug. 4, first deb., to Westminster Bank, Ltd., securing all moneys due or to become due to the Bank; general charge (excluding certain ppties.). *Nil. July 14, 1949.

MERCOL PRODUCTS, LTD., Sheffield, chemical mfrs. (M., 9/9/50). July 27, mort., to Barclays Bank, Ltd. securing all moneys due or to become due to the Bank; charged on land with warehouse, storerooms and offices, 47 Eyre Lane, Sheffield. *Nil. Dec. 30, 1949.

MERRIGLO, LTD. (formerly MERRIGLO (PLASTICS), LTD.), London, W., dealers in plastic materials. (M., 9/9/50). Aug. 1, £11,000 debs.; general charge; also Aug. 1, £3000 second deb., to L. N. Henderson, Radlett; general charge. *£12,000. Apr. 10, 1950.

T. H. PRICHARD & SON, LTD., Abertillery, chemists. (M., 9/9/50). Aug. 2, mort., to Halifax Bldg. Soc. securing £700 and further advances; charged on 19 Coronation Street, Blaina. *£2500 (approx.). Sept. 30, 1948.

UPTON OIL CO., LTD., Upton, Poole. (M., 9/9/50). Aug. 4, £2750. deb. to Branch Nominees, Ltd.; general charge. *Nil. May 17, 1949.

Satisfactions

JOHN LYSAGHT, LTD., Bristol, galvanised sheet mfrs., etc. (M.S., 9/9/50). Satisfaction Aug. 4, of deb. stock reg. Aug. 24, 1929, to the extent of £82,258.

MELWOOD THERMOPLASTICS, LTD., London, E.C. (M.S., 9/9/50). Satisfaction Aug. 1, of deb. reg. Jan. 19, 1949.

PHILIP KIRKUP & CO., LTD., Sunderland, grease, oil and varnish mfrs. (M.S., 9/9/50). Satisfaction Aug. 8, of mort. reg. Dec. 20, 1928.

Receivership

WIMPOLE LABORATORIES, LTD., cosmetic manufacturers and dealers, etc., Garden Street, Walsall. (R., 9/9/50). Mr. Andrew F. Dawes, 15 Calthorpe Road, Edgbaston, Birmingham, was appointed receiver and manager on August 17, 1950, under powers contained in debentures dated June 30, 1949.

Company News

Beecham Group, Ltd.

The trading profit of the Beecham group for the year ended March 31, 1950 was £2,427,430, compared with £1,816,843 for the previous year. The income from sales was £20,926,159, of which £2,427.430 was distributed. Of the latter figure, £1,361,759 was required for tax and £356,896 was retained for additional working capital. The surplus attributable to members of Beecham Group, Ltd., was £836,771, compared with £663,228 the previous year.

Triplex Safety Glass Co., Ltd.

The group trading profits of the Triplex Safety Glass Co., Ltd., for the year ended June 30, 1950, amounted to £278,849, compared with £244,272 for the previous year.

THE STOCK AND CHEMICAL MARKETS

(continued from page 376)

have been fairly good and export business has been maintained at recent levels. Further stiffening in prices of lead and copper compounds has resulted from the movements in the metals.

GLASGOW.—There has been considerable activity and a general increase in orders in the Scottish heavy chemical market. Exports, however, have slowed up considerably owing to the fact that most of the home works are fully committed and fewer chemicals are available.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Recovery of fluosulphonic acid.—United States Rubber Co. May 14 1948. 643,824.

Recovery of fluosulphonic acid.—United States Rubber Co. May 14 1948. 643,825.

Lenses.—Imperial Chemical Industries, Ltd., C. E. Coulman and G. R. Petrie. May 27 1949. 643,938.

Joining of sand cores.—Foundry Services, Ltd., and K. Strauss. May 19 1949. 643,778.

Organo-silicon compounds. — British Thomson-Houston Co., Ltd. June 9 1948. 643,941.

Compositions of olefinic polymers and polymeric 4-vinylcyclohexene dioxide.—Canadian Industries, Ltd. June 29 1948. 643,950.

Purification of acetic anhydride.—British Celanese, Ltd. July 30 1948. 643,700.

Feed heating and feed distribution in forced circulation water tube steam boilers. —La Mont International Association, Ltd., and F. W. Bower. March 31 1948. 643,840.

Bonding of abrasive bodies by means of synthetic resins.—Montclair Research Corporation. March 23 1945. 643,964.

Filters for air or other gases.—Hall & Kay, Ltd., S. Hall and A. Myers. March 26 1947. 643,971.

Production of phenanthridine compounds.—May & Baker, Ltd., and H. J. Barber. Dec. 24, 1947. 643,974.

Fluorescent textiles.—J. L. Switzer and R. C. Switzer. April 16, 1946. 644,201.

Method for destructive distillation of fuel in retort furnaces and means for carrying out the method.—D. Dalin, T. J. Hedback, C. J. Gejrot and A. W. Johansson. July 15 1946. 644,203.

Thermo-injecting moulding press and process.—Defiance Machine Works, Inc., and K. W. Hall. Aug. 2 1946. 643,980.

Piezo-electric apparatus.—Philips Lamps, Ltd. Sept. 5, 1946. 643,983.

Methods of forming particulate-coated articles and the particulate-coated articles resulting from said methods.—Minnesota Mining & Manufacturing Co. Feb. 12 1947.

Production of carburetted water gas.—Imperial Chemical Industries, Ltd., and G. Nonhebel. Feb. 27 1948. 644,004.

Production of shaped articles of polytetrafluoroethylene and copolymers thereof.—E. I. du Pont de Nemours & Co. March 28 1947. 644,008.

Quinoxalines and derivatives thereof.—Merck & Co., Inc. May 7 1947. 644,016.

Manufacture of 3:4-dichloro-1-tetrachlorethyl-benzene.—Ciba, Ltd. May 13 1947. 644,021.

Method of preparing rubbery vulcanisable polymeric materials.—B. F. Goodrich Co. May 19 1947. 644,022.

Method and apparatus for discharging solid fuel from retorts.—Low Temperature Carbonisation, Ltd., J. P. Postlethwaite and J. W. Harley. May 19 1948. 644,023.

Partial oxidation of hydrocarbons.—Clark Bros. Co., Inc. May 30 1947. 644,027.

Aqueous cooling solutions for use in the machining of metals.—Lubrefor. June 6 1947. 644,029.

Production of carbon disulphide.—Pure Oil Co. June 11 1947. 644,030.

Glassware annealing lehrs.—Hartford-Empire Co. July 8 1947. 644,036.

Mineral oil composition. — Socony - Vacuum Oil Co., Inc. July 14 1947. 644,043.

Processes for preparing high molecular weight condensate resins or polymers, and the compositions resulting therefrom.—Monsanto Chemical Co. July 18 1947. 644,046.

Preparation of drying oils having a conjugated system. — Raybestos-Manhattan, Inc. July 23 1947. 644,049.

Methods and apparatus for moulding plastic material.—K. P. Billner. July 24 1947. 644,132.

Process of manufacture of 2, 2-bio-(4-methoxyphenyl)-1, 1, 1-trichloroethane.—E. I. du Pont de Nemours & Co. July 29 1947. 644,051.

Stable pharmaceutical preparation.—V. Kitter. Aug. 1 1947. 644,054.

Welding of non-metallic thermoplastic materials and the fabrication of products therefrom.—Udylite Corporation. Aug. 7 1947. 644,057.

Process of obtaining chorionic gonadotropic hormone.—President and Board of Trustees of St. Louis University. Aug. 7 1947. 644,060.

Processes employing fluidised powdered catalyst or contact material.—Standard Oil Development Co. and C. Arnold. Aug. 26 1947. 644,135.

Methods of contacting gases and finely divided solids.—Compagnie Industrielle de Procedes et D'Applications Soc. Anon. Sept. 16 1947. 644,138.

Method of preparing phthaloyl chlorides.—Wingfoot Corporation. Oct. 1 1947. 644,071.

Solid gas-generating charges.—Imperial Chemical Industries, Ltd., and A. C. Hutchison. Aug. 11 1948. 644,073.

Means for controlling the temperature of hot gases.—J. Lucas, Ltd., R. J. Ifield and O. N. Lawrence. Oct. 1 1948. 644,140.

Formation of metallic films by thermal evaporation. — Polytechnic Institute of Brooklyn. Oct. 31 1947. 644,077.

Production of streptomycin.—Distillers Co., Ltd., C. J. Jackson and J. Milner. Nov. 3 1948. 644,078.

Pectin products and the process of making same.—H. Welch. Nov. 25 1947. 644,081.

Apparatus for drying and heating powdered granular or like substances. — Conreur, Sahut & Cie. Dec. 30 1947. 644,093.

Casting of chromium alloys.—Power Jets (Research & Development), Ltd., T. A. Taylor and N. Stephenson. Feb. 3 1949. 644,094.

Phenthiazine derivatives. — Soc. des Usines Chimiques Rhone-Poulenc. Jan. 19 1948. 644,101.

Preparation of derivatives of tropine.—Wellcome Foundation, Ltd., and D. W. Adamson. Feb. 4 1949. 644,115.

Methods of and apparatus for cleaning, rustproofing, prime coating and spray painting sheet metal articles such as vehicle bodies.—Carrier Engineering Co., Ltd., and A. P. Fowler. March 8 1949. 644,169.

Spraying of metal powders. — Schori Metallising Process, Ltd., and R. Dickinson. March 23 1949. 644,218.

Diazotype photoprinting layers having cyan acetyl amides as azo coupling components.—General Aniline & Film Corporation. June 4 1948. 644,186.

Holders or containers for small ferromagnetic articles.—Jessop & Sons, Ltd., and D. Hadfield. June 29 1949. 644,194.

Connection of valves to fluid conduits.—British Oxygen Co., Ltd., G. F. Arcus and G. D. Black. June 17 1949. 644,237.

Revivification of metallic hydrogenation catalysts.—E. B. Maxted. Aug. 6 1949. 644,239.

Burning of cement in rotary kilns.—C. E. Every (Smidth & Co., F. L. Aktieselskabet,). July 29 1948. 644,247.

Photographic developers.—May & Baker, Ltd., D. H. O. John and G. T. J. Field. July 31 1948. 644,249.

Apparatus for the biological properties of air in rooms.—Hydro-nitro Soc. Anon. Sept. 1 1949. 644,264.

CLASSIFIED ADVERTISEMENTS

SITUATION VACANT

THE Civil Service Commissioners invite applications for permanent appointments as **ASSISTANT EXPERIMENTAL OFFICER** to be filled by competitive interview.

The posts are in various Government Departments and divided between following main groups and subjects (*a*) Mathematical and Physical Sciences, (*b*) Chemistry and Metallurgy, (*c*) Engineering Subjects and (*d*) Miscellaneous (including e.g. Library and Technical Information Services). No further applications can be accepted from Biologists, Geologists or Meteorologists.

Interviews will be held throughout the remainder of the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced either for the competition as a whole or in one or more subjects.

Candidates must be at least 17½ years and under 26 years of age (or under 31 for established Civil Servants of the Assistant (Scientific) Class) on 1st August, 1950; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with mathematics or a science subject as a principal subject, or an equivalent qualification; but candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London Salary Scale (men) is £230-£490. Salaries for women and for posts in the provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

Further particulars and forms of application from the **Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1., quoting No. 3068.**

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INDIAN **TECHNICAL GRADUATE** in **CHEMISTRY** wants paid apprenticeship in a British Chemical Firm and will work as representative in India or in any other service after training. Box No. C.A. 2949, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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Four **GARDNER HORIZONTAL MIXERS,** for powders, from 100 lbs. to 250 lbs. capacity, all motorised, three with Radicon Reduction Gear Boxes and one with a Spur Gear Drive.

Two large unjacketed **WERNER MIXERS,** belt and gear driven, hand tipping, double "Z" arms, pans 53 in. by 45 in. by 36 in. deep.

No. 200 One nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR.** Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

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The Chemical Age

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Volume LXIII 16 September 1950 Number 1627

The New Antibiotic

THE high hopes and wide publicity evoked by the belated announcement of the isolation of streptomycin, which was in fact achieved more than six years ago, would have much more justification in some facts disclosed in a current report by the principal group concerned in the sixty-year-old study of the actinomycetes. That is the production of neomycin, of which the significant new potentialities have been described in Paris this week before the first international Congress of Internal Medicine* by Dr. Selman Waksman, who first isolated streptomycin (in the department of microbiology at Rutgers University, U.S.A., in 1943).

The importance of this discovery lies in the fact that neomycin is reliably credited with having repaired some of the most serious defects of streptomycin, the existence of which, however, has not been able to outweigh the social and economic value of the earlier antibiotic. Streptomycin now supports a large and growing specialist industry here and one infinitely larger in the U.S.A., where precedence in development permitted exports to begin in 1948.

The most disconcerting fact about streptomycin, which caused medical men and health authorities to restrict its use, has been its liability to stimulate the evolution of resistant strains of the *microbacterium tuberculosis*. Nevertheless its overall effect as an inhibitor justified the belief that it offered in some cases the best hope available of recovery from some of the most destructive forms of the disease. The other recognised disadvantage of streptomycin therapy was the production of toxic effects, particularly of neurotoxic symptoms of varying gravity. The production of dihydrostreptomycin during 1948, by the catalytic hydrogenation of streptomycin, reduced by about half the seriousness of that factor.

In all these aspects and some others equally important neomycin is reported by Dr. Waksman to have gone far towards removing the objections to the more widespread use of this family of antibiotics. In assessing these new characteristics it has to be borne in mind, however, that these are laboratory results. What is observed *in vitro* or in the treatment of laboratory animals has often been shown to have been very different from the response when the same substance is introduced into the complex human organism. With those reservations, which Dr. Waksman does not fail to

* The paper is dealt with at length in the *British Medical Journal* 4679, 595-600

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

make, the importance of the new possibilities appears to indicate the achievement of a decisive advance. The justification of that conclusion is supplied by Dr. Waksman's own brief summary of the facts. He says:—

1. Neomycin is more active than streptomycin against both the saprophytic *Mycobacterium* 607 and the human and animal pathogenic strains of *M. tuberculosis*.

2. Neomycin is as active against the streptomycin-resistant strains of the above organisms as against the sensitive ones.

3. Neomycin favours to a far less degree than does streptomycin the development of resistant strains of mycobacteria; it is true that on prolonged serial transfer of large numbers of cells a considerable increase in resistance may be obtained, but the rate of increase is much slower than in the case of streptomycin.

4. Neomycin is characterised by a relatively low toxicity in animals and has a high therapeutic index.

The results recently published by Karlson, Gainer, and Feldman (1950) brought out the fact that neomycin is capable of producing a reversal of progressive tuberculosis in experimental animals. It is also effective against experimental infections due to streptomycin-resistant tubercle bacilli. A number of clinical cases, representing different forms of tuberculosis, are now being treated with neomycin, and it is expected that before very long a clear picture may be obtained of the potential place that this antibiotic may find in the treatment of tuberculosis. The possibility of combined action of neomycin and streptomycin or another antimicrobial agent is also receiving much consideration.

Some of the experimental results reported from the U.S.A. suggest that Dr. Waksman has certainly not overstated the merits of the new antibiotic. A comparison has been made of the amounts of neomycin and of streptomycin required to inhibit growth of different mycobacteria in laboratory tests. To secure inhibition of growth of *M. tuberculosis* in a liquid medium required 1-5 microgram of streptomycin and only 0.5 unit of neomycin. The most striking results were expectedly, associated with the streptomycin-resistant infections (*M. tuberculosis* H37RvR and *mycobacterium* 607R). In these the ratios of effectiveness of neomycin and streptomycin were differentiated by factors of several thousands. Such evidence, added to the claim that the new antibiotic is active against both common forms of mycobacterium, even after they have acquired immunity during unsuccessful treatment with streptomycin, encourages the hope that chemotherapy has acquired for the campaign against tuberculosis a second weapon more effective than any it has yet employed.

The Paris report unfortunately

(*continued on page* 386)

Notes and Comments

Fair Dealer

AN exasperating defect of much that is written or spoken about the need for fair dealing between industries and employees is the inability to take an impartial view. One of the best indications that it is possible to portray without prejudice the present relationship between employers and employed of all categories comes from Dr. W. H. Garrett (Monsanto Chemicals, Ltd.) in a monograph of a novel and distinctive kind, "The Human Side of Industry." He surveys more directly than have any recent commentators the true duties and objectives of managements and the common causes of friction and distrust in "industrial relations." He does not hesitate in castigating the short-sighted policies on both sides from which most contemporary troubles have sprung. Dr. Garrett's distinguished record in conciliation, as chairman of the Joint Industrial Council of Chemical Industry and member of the Association of Chemical and Allied Employers and of national arbitration tribunals, lends weight to his conclusions and his advice on measures which could dissipate old antagonisms and avert some incipient ones. Of topical importance in that connection are his remarks on the comparative neglect of the "white collar worker," which describes large numbers of chemists as well as supervisory staffs, whose prospects certainly are not improved by the "victories" of organised labour. The solution to the impending problem there is implicit in his summing up: "A trade union has no useful function for a group of employees who are adequately rewarded for their effort. The choice before management is clear. . . ."

Science Forum

THE announcement that Downe House, Orpington, Kent, may become a residential centre where practically all may receive short courses and so gain a more confident understanding of the scientific method and of some current objectives of the sciences will afford much satisfaction to those who have preached the need to broaden the basis of this phase of public information services. This would not be yet another school for specialists. It would serve, for a change, the many who probably have no scientific qualifications or academic distinction, but who share the scientist's taste for facts rather than fairy tales. The proposal is unique in its purpose of bringing together under one roof students and teachers, technicians and artisans, writers and the rest on terms which will not put the uninitiated at any great disadvantage or waste the time of the expert auditor. Few specialists would grudge an occasional visit to learn something of what is being attempted in other fields. This original conception is still, unfortunately, not much more than the seed from which it is hoped the crystal will grow. The speed of that process will depend upon the activity of the British Association, Kent County Council and Oxford University, which sponsored the idea. It will have a host of unnamed supporters because it will apparently have nothing to do with administering sugar-coated doses of ill-balanced information and will give responsible guidance of public opinion at a critical juncture in scientists' affairs.

Finding the Answer

ANOTHER information service, in this instance principally for industries, is foreshadowed in an original expansion of the liaison services which the Department of Scientific and Industrial Research has just initiated Making profitable use of the "brains trust" and "quiz" methods, DSIR Intelligence has launched in the form of a bulletin, "Unanswered Questions," an attempt to uncover the answers to specific scientific and technical questions "when normal sources of information have apparently failed." The great merit of this somewhat daring

sop to the widespread thirst for specialised information is its intention to glean information from its supporters as well as to provide it. Since success in providing the right answer consists almost entirely in knowing where to look for it, this broadside procedure should have good results. The first bulletin presents fourteen questions selected from the responses to a preliminary circular—and one answer. Significantly, five of the fourteen are questions more or less intimately related to chemistry.

Subdividing the Sciences

THE recent formation of yet another scientific group—in this instance a medical one as its suggestive title, the Bone and Tooth Society, indicates—is one of many reminders of the unending multiplication and subdivision of the departments of science. Scarcely any quarter of the year passes unmarked by the emergence of a new organisation focusing its attention on one or other sector of the front of scientific advance. The effect of all these new specialist subdivisions is to heighten the boundary walls of specialisation and diminish a little more the traditional functions of the major societies. The multiplication of specialist groups might be deplored but for one circumstance—they are all needed. The " all round " scientist of 30 or 40 years ago as a species is extinct and the spacious " back rooms " he inhabited have been subdivided and reallocated as thoroughly as has the Victorian mansion.

Parent Societies

A GOOD deal of attention since the war has been given to purging scientific education of specialised tendencies. Societies and individuals have called for broader and more fundamental training and there are signs that the universities and other centres are delaying the impact of specialisation upon students until the last phases of training. This is all to the good. But the young scientist, when he emerges, finds himself confronted with innumerable units of discussion and publication and is obliged to enter into the specialised outlook. Each important industry is tending to create its own technical society and forum. The whole situation cannot have escaped the attention of the principal organisations. They alone can hold the many sections together and stimulate lateral lines of communication between the increasingly numerous subdivisions. It must be ensured that the addition of more branches year by year does not cause an equivalent subtraction of interest in the meetings and publications of the parent societies.

Rearmament Programme

THE summing up by the Prime Minister to Parliament this week of the effects in industry of the urgent rearmament proposals did not add much to what any intelligent speculation must have indicated. He did not specify what " some new demand on chemical industry " might represent, although his reference to it in the context of the textile and building industries did not suggest the degree of urgent priority which an arms programme is capable of demanding. The conclusion that no precise plan for specialised chemical production has been formulated seems justified. The other reliable indications concern likely diversions and reallocations of export products and possibly some redistribution of workers.

THE NEW ANTIBIOTIC

(*continued from page* 384)

throws little light on the laboratory methods by which neomycin was produced or upon its suitability for large-scale manufacture. It serves, however, if incidentally, to present the new antibiotic in its proper perspective, as one more heartening stage in the investigation whose inception is discernible in Gasperini's proofs in 1890 of the antibacterial action of streptothrix. Neomycin is treated by Dr. Waksman as a beginning rather than an end. " Sooner or later," he says, " other antibiotics will be found which are more effective than either (streptomycin or neomycin) and less toxic . . . Finding these is merely a matter of further research."

BRITISH ENTERPRISE IN U.S.A.

New Trade Promotion Centre

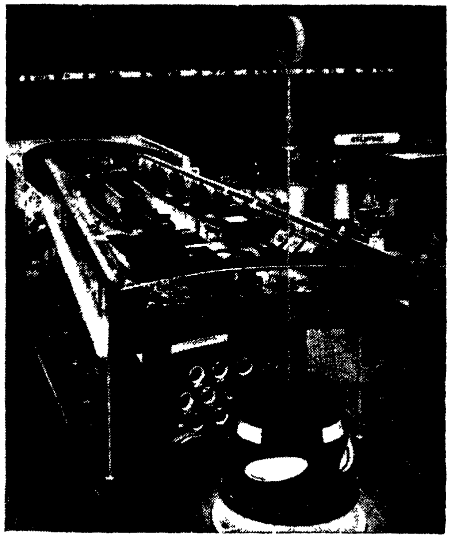
DETERMINATION to do everything in its power to close this country's "dollar gap" through the methods of private enterprise finds new evidence in the opening on September 7 of the British Trade Promotion Centre, at Fifth Avenue (at 53rd Street), New York City.

It has been made possible entirely by the initiative and support of trade organisations and private firms.

The centre is being organised and managed by the British Commonwealth Chamber of Commerce in the United States, and organisations in the U.K. which have already signified their intention of participating in it are the Dollar Exports Board, the Federation of British Industries, the National Union of Manufacturers, the Scottish Council (Development and Industry) and BETRO. The centre's main functions are to provide information, advice and help to British industrial organisations and individual firms on any and every aspect of exporting British goods to the U.S.A., and to represent the views of British industry, as occasion requires, to the American authorities and American business men.

An important feature of the services of the centre is the provision of offices available for letting on a day-to-day basis to visiting British business men, together with secretarial help if required.

Private enterprise in entering the American market found additional expression at the National Chemical Exposition at the Chicago Coliseum, staged from September 5 to 9 by the Chicago section of the American Chemical Society. Among the exhibits there was a display of the products of the Watford Chemical Co., Ltd., including synthetic caffein and theophylline, new emulsifiers and thickeners for the pharmaceutical industry; new stabilisers and antioxidants for cosmetics; a synthetic drying oil for paint manufacture; a high grade of glyceryl monostearate for use in the ice cream and margarine industries; and a new range of oil additives for lubricating oils. This is stated to be the first time Britain has entered the U.S. market with substantial exports of specialised oil additives.



The I.C.I., Ltd., stand at the recent International Fair at Chicago represented a highly individual representation of a wide sector of British chemical production

U.S. Simplifies Sulphuric Acid Plant

BY eliminating seven major items of equipment, a new process developed by the Chemical Construction Corporation, New York City, is claimed to reduce greatly the cost of producing sulphuric acid. The new design is said to be much simpler than the conventional contact process and to save as much as 20 per cent of the present capital cost of erecting a medium-size sulphuric acid plant in the U.S.A. The first commercial-size installation using the simplified layout, from which major items of equipment have been eliminated, went into operation recently at American Cyanamid Company's works at Hamilton, Ohio.

Traditional components used in conventional contact process sulphuric acid plants which are no longer needed with the new design include the gas filter, the heat exchanger, the sulphur trioxide cooler, the acid coolers, the acid circulating and transfer pumps, and the diluting equipment.

£10 M. LOAN FOR DISTILLERS

Developing the Industrial Side

THE third large addition to the funds employed by chemical organisations in Great Britain is announced by The Distillers Company, Ltd., which has obtained Treasury consent to borrow £10 million, by the private placing with "certain corporate investors" of unsecured loan stock. The new money is required to finance expansion of the company's potable spirits undertakings and for the further development of the industrial side of the group's business, of which British Industrial Solvents is prominent.

The money is to be raised in two portions, of which the first will be £4 million in a 3½ per cent stock at par, which will be be repaid in equal annual instalments of £1 million, starting in 1952 and ending in 1955. The second portion of £6 million will be derived from the issue of 3 15/16 per cent stock at par, repayable by four annual instalments of £1 million, starting in 1956, and a final payment of £2 million in 1960. Repayment is to be made out of profits.

As in the instance of the I.C.I. 4 per cent loan stock (THE CHEMICAL AGE, 63, 351), there is to be no public issue and no application will be made for Stock Exchange for leave to deal.

Developing Wool Chemistry

ADVANCES in wool chemistry were discussed and new laboratory apparatus was on view at the annual summer conference of the Society of Dyers and Colourists held this week at Leeds University.

Professor J. B. Speakman, in the opening lecture, said that variations in dyeing which produced effects such as bad levelling, skittering, etc., were now attributed to variations in the chemical constitution of the wool fibre.

Changes equivalent to as much as 4 per cent in the molecular constitution of wool between individual fibres in a single wool lock had been recorded. This had stimulated attempts to devise a chemical pretreatment which would overcome a number of the difficulties previously experienced in wool dyeing.

The new apparatus displayed, designed by a member of Leeds University staff, is designed to test the dye absorption of wool under conditions of constant concentration of the dry batch. The concentration is automatically controlled by a photo-electric cell and relay delivering a supply of dye, and so maintaining the concentration at a constant level.

NEW PHOSPHORUS PROJECT

Opposition by Somerset Council

AN adverse report on the suitability of Portishead, Somerset, as a site of a a phosphorus producing plant to be set up at a cost of approximately £1.25 million by Albright and Wilson, Ltd., of Oldbury, has been issued by the Portishead UDC. The council has decided to advise Bristol City Planning Committee and Somerset County Planning Committee of its opposition, on the ground that the factory would injuriously affect the amenities of the Portishead district.

The company is stated to have agreed with the Board of Trade that only phosphorus should be produced at the new plant. If later it was economically impossible to produce phosphorus the firm might have to ask for a change of user to be granted. The firm was also negotiating for a site in another district, at which the ancillary processes would be carried out.

The council conceded that there was no evidence that there were ill-effects on health in the neighbourhood associated with the manufacture of phosphorus alone. If the undertaking were given to restrict manufacture to that, they would not be unduly worried from the health point of view. As far as could be ascertained, there would be no ill-effect from the effluent on persons bathing in the Bristol Channel at Portishead, or as far down as Weston-super-Mare.

The firm had stated that the naked flame observed at one part of the works at Oldbury could be concealed at the new works at Portishead, as could the globes and furnaces. The firm was considering the possibility of pneumatic unloading to overcome the possibility of a dust nuisance arising from the unloading of the phosphate rock at the dock. The further decision on the suitability of the site is in the hands of the Bristol Planning Committee, whose approval would override the decision of the Portishead Council. If the Bristol authority rejected the proposal Albright & Wilson would still be at liberty to seek a public inquiry by the Ministry of Town and Country Planning.

Synthetic Wool

Increasing wool prices have lent an added interest to plans of I.C.I., Ltd., to accelerate the commercial production of Ardil synthetic textile fibre. Work is being speeded up at Dumfries to secure the earliest possible operation. Fuller information on supply prospects should be available in January.

TANNERY CHEMICALS

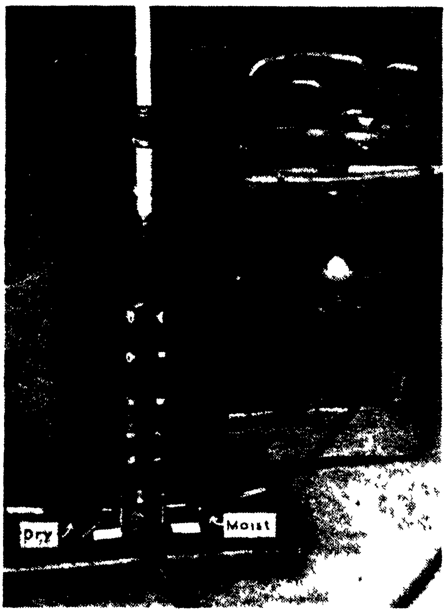
Shoe and Leather Fair Exhibits

SOME 27 firms of producers and importers of tannery chemicals, extracts, adhesives, stains and finishes were among the 400-odd exhibitors at the 41st Shoe and Leather Fair, held at Olympia, London, from Monday to Friday this week.

A tour by THE CHEMICAL AGE of the stands early in the week disclosed evidence confirming the impression generally held that methods of tannage and leather dressing and the materials used have not changed to any notable extent since the war.

Some war-time practices enforced by certain material shortages, have, in fact, been perpetuated.

A notable example is the dispensing to a large extent with chestnut, considerable quantities of which were imported before the war from France and other European countries in both solid and extract form. Tanners have found a satisfactory substitute for this by an adjustment of the mimosa tannage.



A new assembly from the Egham laboratories of the British Leather Manufacturers' Research Association, exhibited at the Shoe and Leather Fair, which illustrates quantitatively the capacity of normal leather (powdered for the purpose) to generate sensible heat when it absorbs moisture

Since the war, the principal tanning materials used have been quebracho, mimosa and myrabolams, and latterly quebracho has receded somewhat from the picture owing to purchasing difficulties in the Argentine.

For some leathers there is a decided tendency to employ synthetic tanning materials in place of the established vegetable extracts, thus perpetuating the war-time trend.

The British Leather Manufacturers' Research Association has played an important part, complementary to the work of certain tanners' own research staffs, in discovering and establishing the war-time substitute tanning materials and methods, some of which have now become everyday practice.

Heat Generated

The Research Association's exhibit included an ingenious piece of apparatus, designed and constructed at its Egham (Surrey) laboratories, for demonstrating and measuring the thermostatic properties of leather. Some of the many other tests undertaken at the association's laboratories were demonstrated.

Among the chemical and associated firms exhibiting were:—

Adhesives and Allied Products, Ltd ; Wm Aitken & Sons B B Chemical Co , Ltd. ; Bowmans Chemicals, Ltd , British Cellulose Lacquers, Ltd. ; Calder & Mersey Extract Co , Ltd ; Cavendish Trading Co (Chemicals), Ltd ; Earnshaw, Ltd , Fletcher, Miller, Ltd ; The Forestal Land, Timber and Railways Co Ltd ; Grant, Wilson & Co , Ltd , The Hexoran Co , Ltd ; Richard Hodgson & Sons, Ltd ; I C I , Ltd (Leathercloth Division) , Keiner & Co , Ltd ; Lankro Chemicals, Ltd ; McVittie, Anderson & Co , Ltd ; Nene Finishes (Northampton), Ltd ; Pancreol, Ltd ; F H & H. S Pochin, Ltd ; Sternol, Ltd ; Tuxcan, Ltd. ; Vacuum Oil Co , Ltd. ; Vik Supplies, Ltd ; T Webster & Co , Ltd , Roy Wilson, Dickson, Ltd , The Yorkshire Dyeware & Chemical Co , Ltd

Textile Chemicals

A full range of its chemical products of importance to the textile industry will be featured by Monsanto Chemicals, Ltd., on Stand 16 at the Knitting Machinery and Accessories Exhibition to be held at Granby Hall, Leicester, from October 11 to 21 inclusive.

Increased Production of Some Essential Chemicals

Substantial Changes in June

PRODUCTION in June of basic chemicals in general was higher than in the same month last year. The outstanding increases in output were (in thousands of tons):—sulphuric acid 153.3 (137.4); industrial alcohol (mil. bulk gal.) 2.65 (1.83); superphosphate 19.9 (16.3); and compound fertiliser 170.5 (114.2). Consumption was also greater, notably of superphosphate 19.6 (8.8) and compound fertiliser 180.7 (46.6), while stocks at the end of the period showed an improvement, with the exception of molasses and industrial alcohol.

Among the non-ferrous metals the greatest increase in production concerned lead, of which output was 6.59 thousand tons, compared with 2.78 thousand tons in June, 1949. Despite an increase in consumption of this metal, stocks improved, as did also stocks of zinc concentrates. Copper and zinc stocks were, however, reduced.

Estimated numbers employed in the chemical and allied trades were slightly lower than in May, the total (in thousands) being 445.5, which was 12.7 more than in June last year. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 257.1 (189.5 men, 67.6 women); paints and varnishes 38.8 (27.5 men, 11.3 women); oils, greases, glues, etc., 66.9 (54.0 men, 12.9 women); pharmaceuticals, toilet preparations, etc., 82.7 (43.0 men, 39.7 women).

These facts and the table below are derived from the *Monthly Digest of Statistics*, No. 56.

	June, 1950 Thousand Tons			June, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	
Sulphuric acid	153.3			137.4	132.0	---
Sulphur...		30 5	100 1	-	25.3	94.5
Pyrites	—	17.3	74.9		18.1	70.6
Spent oxide	--	14.5	185 3	.	16.3	171.6
Molasses (cane and beat)	11.4	39 4*	181 9	9.8	24.9*	288.0
Industrial alcohol (mil. bulk gal.) ...	2.65	2.61	0 76	1.83	2.12	4.61
Ammonia		7.09†	10 4	--	6 8†	5.69
Superphosphate	19.9	19.6		16.3	8.8	
Compound fertiliser	170.5	180.7		114.2	46 6	
Liming materials	-	521.2		—	432 6	
Nitrogen content of nitrogenous fertilisers	21.74	25.61		20.32	13 73	-
Phosphate rock	-	94 8	308.5	—	77.4	206.7
Virgin aluminium	2.46	14 7		2.65	13.4	
Virgin copper		29.6	125.2	-	29 4	127.0
Virgin zinc	6.93	20.3	52.7	5.87	13.6	75.4
Refined lead	6.59	14 3	74.1	2.78	9.3	59.6
Tin	2.6‡	3.59		2.78	2.07	22.0
Zinc concentrates		13 5	68.5		13.2	29.2
Magnesium	0.3	0 47		0.47	0.41	--
Pig iron	182.0	140 0	515 0	186.0†	139.0†	303.0
Steel ingots and castings (including alloys)	313.0	--	1,352.0	301.0†		1,177.0
Rubber: Reclaimed	0.65	0.61	2.54	0.35	0 45	3.05
Natural (including latex)		4.80	41.1		3 46	43.1
Synthetic		0.06	0.80		0.05	1.63

* Distilling only † Average of five weeks

Record Exports in August

EXPORTS from the United Kingdom in August (26 working days) were provisionally announced this week to have reached a total of £196.7 million. August is usually a poor export month, but this year's figures were £5.6 million higher than the previous export record of £191.1 million attained in March.

Imports were provisionally valued at £214.9 million, with re-exports at the high figure of £7.4 million. The excess of imports (valued c.i.f.) over exports and re-exports (valued f.o.b.) was £18.1 million, the lowest figure since February, 1949.

Dollar export figures were also good. U.K. exports to the U.S.A. in August totalled $30.7 million (£11 million), which was nearly as large as the record achieved in July. Exports to Canada again increased and, with a total of $34.1 million (£12.2 million), were only slightly below the May record. The combined figure of exports to North America was equivalent to $64.8 million.

METAL PRICE INCREASES

Lead Reaches New High Level

ANOTHER increase in the price of good soft pig lead by £8 from £120 to £128 a ton, delivered, was announced by the Ministry of Supply on September 9. This was the second rise by the same amount in 10 days, and brings the price higher than the peak level of £123 reached during the boom of 1948.

The cost of good ordinary brand zinc was also raised, on September 8, by £20 from £127 10s. to £147 10s. a ton, delivered. Prices of other grades varied correspondingly. Manufacturers of zinc oxides announced that prices for lots of not less than two tons (delivered buyers' premises), would be increased by £17 10s., as follows: Red seal from £119 to £136 10s.; Green seal from £120 10s. to £138; White seal £121 10s. to £139.

Wolfram ore prices were subject to a further nominal rise of 5s. on September 8, between 200s. and 210s. a unit c.i.f. European ports.

NCB Results

THE saleable output of the National Coal Board for the second quarter of 1950 was 50,083,774 tons, compared with 49,320,711 tons in the second quarter of 1949; 46,337,819 tons were " disposable commercially." The cost per ton was 45/3.6d. (45/2.2d. in 1949) and the total costs were £113,431,442. Proceeds were £120,160,413, giving a profit for the quarter of £6,728,971. After deducting interest and Profits Tax this left a surplus of £2,451,971. Total average earnings for underground workers was £9 10s. 11d. and for all workers £8 19s.

Comparison with the previous quarter reveals that proceeds of colliery operations were more than £6 million lower. The net deficiency since nationalisation has been reduced to £4,084,826.

Figures for coal production up to last week end suggest that this year's objective of 205 to 210 mill on tons of deep-mined coal is unlikely to be achieved. Comparative details are:—Last week: 4,213,600 tons (deep-mined 3,976,000 tons, opencast 237,600 tons); previous week: 4,132,300 tons (deep-mined 3,924,600 tons, opencast 207,700 tons).

Galvanising Experts Visit to U.S.A.

A specialist team on galvanising left England on Thursday for a study tour of U.S.A. plants arranged by the Anglo-American Council on Productivity. They will return from New York on October 31.

NEW AFRICAN PROJECTS

Explosives for N. Rhodesia

A REPORT from Salisbury, Northern Rhodesia, states that explosives for use in the four mines of the copper belt may be manufactured there if a proposal to the Government is accep ed. The creation is suggested of a £250,000 finance corporation to encourage the establishment of new industrial and commercial enterprises such as this. Imports of ammunition and explosives into Northern Rhodesia increased from £326,299 in 1945 to £629,567 in 1949, and the belief is expressed that, when local demand reaches £750,000 a year, the establishment of an explosives factory will be economically practicable. If the copper mines achieve their planned 30 per cent increase in output, this figure will be attained.

S. Africa to Expedite Coal Oil Plan

Mr. Louw, Minister for Economic Affairs, announced on September 12 that the Government would guarantee up to £13 million to finance the first company to manufacture oil from coal in South Africa. So that preparations may begin immediately the Industrial Development Corporation is being asked to make £200,000 provisionally available.

Australian Coal and Steel

BROKEN Hill Pty., Australia's largest industrial group, is spending £A3 million on the mechanisation and development of its coal mines on the south coast of New South Wales. Within the next year almost the whole of the output is expected to be won mechanically. This will increase the industry's total colliery capacity from 3 to 4 million tons a year. The building up of the company's coal production is stated to be a major step towards the expansion of Australia's steel industry through the Port Kembla works of Australian Iron & Steel, Ltd., the principal subsidiary of Broken Hill Pty. The programme envisages an increase of 50 per cent in the steel ingot capacity of Port Kembla, and the production of more than a million tons of flat steel products annually.

Oil Survey at Southport

Southport Town Council on September [illegible] gave permission for immediate test borings by the Anglo-Iranian Oil Co., Ltd for oil on Southport foreshore, between Ainsdale and Birkdale. This survey does not commit the corporation to grant rights to sink oil wells there.

CHEMICAL SALVAGE—II

Some Further Reclamation Processes

by I. BERKOVITCH, M.Sc.(Tech)., A.R.I.C.

FROM waste washing waters which contain a much lower concentration of copper and acid, the copper is recovered by passage through a bed of scrap iron yielding the copper as a metallic sludge.

Two wastes are combined to yield three useful by-products in one ingenious salvage operation used in a galvanising plant.[9] The wastes are pickle liquor from steel cleaning and zinc skimmings from the galvanising tanks. Before it is fed as slurry to a main reactor tank the zinc is all converted to the oxide. Pickle liquor is freed from dirt, then brought into reaction with the zinc oxide (in the form of slurry) and with chlorine gas. Ferrous sulphate, zinc sulphate and zinc chloride are all recovered.

Successful Metal Recovery

Ion exchange methods are recommended for use in waste treatment only where some relatively valuable material can be recovered for sale or re-use.[10] There are successful examples of metal recovery, organic compounds recovery and removal of impurities by the use of ion exchange. Copper and chromium in the wash waters from pickling copper alloy can be concentrated more than 25-fold by taking them up on this type of material and subsequently regenerating. Many processes for the recovery of precious metals have also been described.

Nicotine has been recovered from the exhaust gases of cigarette tobacco driers by scrubbing the gases with water or dilute acid and passing this nicotine through a cation exchanger of the sulphonated coal type. The nicotine is obtained by treatment of the exchanger with ammoniacal alcohol. Ion exchange may also be applied by removing undesirable impurities from a solution which is later concentrated for recovery of valuable solids. It has been used for the demineralising of waste sugar solution, the effluent afterwards being concentrated to a syrup.

Quite recently in the U.S.A. industrial alcohol has been successfully produced from fruit cannery wastes,[11] and it now appears possible that this is a practical solution of the growing waste-disposal problem of that industry. Pear waste, for instance, supplemented by the addition of small amounts of nitrogen in the form of ammonium sulphate, urea or ammonium carbonate, can be fermented continuously. In a 10-hour cycle it can produce 4.2 per cent alcohol by volume. This represents a 90 per cent efficiency in the conversion of sugar into alcohol. Apples which also require nitrogen fortification, ferment somewhat more slowly but produce a higher amount of alcohol.

In adapting industrial fermentation to cannery wastes the continuous alcoholic fermentation is carried out in a mobile unit. This gives many economies since a mobile unit is shared among canneries in different seasons. Such a unit consists of a complete distillery mounted in railway trucks with sufficient capacity to process the daily output of waste from the average cannery.

The most satisfactory continuous system is the two-fermenter one. This consists of two vessels connected in series. The first is filled with sterile medium and inoculated with yeast; then fermentation is allowed to proceed to a desired point. At this time continuous addition of fresh medium is started at a rate equal to the rate at which the yeast is growing and fermenting. At the same time the partially fermented material is continuously withdrawn from the first vessel and added to the second vessel in which fermentation is allowed to go to completion.

Cattle Feed from Cannery Waste

The unit occupies five railway trucks; one is for milling, cooking and distillation, one for fermentation, one for recovery and drying of fermentation residues, one for utilities and one for a steam generator. Unfortunately, the process is not yet fully profitable in this form. However, the residue after distillation is a high-grade yeast protein. Cattle-feeding trials are being carried out on representative samples of this by-product. Suitability of the dried residue as feed will not only solve the waste-disposal problem but its value will determine whether the process is profitable.

Slags produced during metal making have attracted the attention of many chemists.[12] When iron is made in a blast furnace the principal reaction is the reduc-

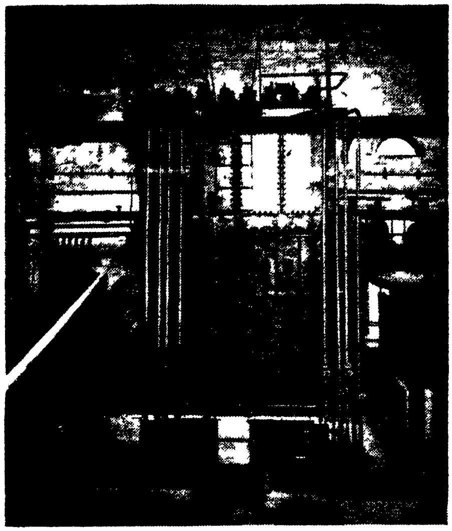
tion of iron ore (usually ferric oxide) by carbon monoxide produced from the coke which is simultaneously fed to the furnace. In order to remove impurities in the ore, a flux must also be added which combines with the impurities to form a liquid. The latter is the slag, which consists largely of calcium silicate but is generally very complex in composition.

Main developments in using blast furnace slag have been in Germany and U.S.A., both of these countries being in a worse position than Britain for supplies of chalk and clay, the raw materials for Portland cement manufacture. Slag has actually been used for production of road-making materials, railway ballast, building stone, insulating materials and fertiliser.

Raw blast furnace slag may be immediately granulated by water or compressed air sprays acting on the stream of molten slag as it issues from the furnace. Alternatively, the slag may be allowed to cool either in the pot or on the dump, then crushed and ground to the fineness required. The granulated slag is suitable for blending in when making mortars, cements, building stones, breeze blocks and insulating blocks. From the slow-cooled slag, road-making materials and railway ballast may be made. Particularly in the Middle West of the U.S.A., it is added to concrete during mixing, instead of sand or ballast, as a filler. As slag wool it is used as a heat insulator.

So-called "basic slag" is used as an agricultural fertiliser. It is a product of

Lessing process flue gas scrubber



Both pictures by courtesy of Dr R Lessing

Lessing process coal gas scrubber

the basic Bessemer process for steel manufacture, in which the furnace has a dolomite lining. This yields a metal quite free from phosphorus and a slag to which any original phosphorus has been transferred. This element then becomes available for soil enrichment.

The possibility of turning waste industrial gases into money has also stirred a certain amount of chemical interest. A large number of suggestions have been made for recovery of marketable products. Almost all gases discharged from metallurgical operations carry some material worth recovering. This may be in the form of dust produced in ore-handling or furnacing, or in the form of vapour of volatilised products. The most common filtration equipment used in metallurgical plants is the bag-filter made of some appropriate fabric, which may be cotton or wool. Such filters are economically superior to other types of collectors because of their low cost, high efficiency and relatively low power consumption. The power consumption arises because of the fans required to overcome the resistance to gas flow which the filters produce.

Next in importance is "scrubbing." Most effective of scrubbers are spray chambers with baffles which give the gas a tortuous path. The use of electrical precipitation for collecting suspended particles has also increased rapidly in recent years.

A new device applied for dust collection

is the application of ultrasonics. Essentially, dust particles are caused to oscillate or vibrate under intense sound waves at frequencies above the audible range; the particles collide violently and agglomerate. This makes them easy to remove in a cyclone or other mechanical separator. Whatever the method of separation, the recovered dust is then treated to extract metal.

A completely integrated scheme developed in Canada has recently been described.[15] Here under one management there are working a large-scale chemical fertiliser plant, a mine and a metallurgical plant. Main products are refined lead and zinc. Gold, silver, antimony, bismuth, cadmium and tin and by-products are obtained from the slimes of the electrolytic cells in which the final refining is carried out.

Recovering Sulphur Dioxide

The first step in the smelting of both the lead and zinc ore concentrates is the removal of sulphur as sulphur dioxide. Before the chemical plant was built, the gas, when released to the atmosphere, was the source of much controversy and even litigation. Eventually, legal restrictions forced the company concerned to consider suitable processes for gas recovery. The aim, of course, then became not only to extract sulphur dioxide from the stack gases, but to obtain it in such a form that it could be sold, so that the recovery plants would be at least self-supporting.

The plan developed was to recover the sulphur as sulphuric acid and so utilise it in fertiliser manufacture. This was done by organising ancillary manufacturing process, in order to turn out only saleable products. So, in addition to production of sulphuric acid from sulphur dioxide. the firm carries on synthesis of ammonia from nitrogen and hydrogen and the treatment of phosphate rock with sulphuric acid to produce phosphoric acid. With ammonia, phosphoric acid and sulphuric acid available, a balanced fertiliser production programme becomes possible. Ammonium phosphate, ammonium sulphate and ammonium nitrate form the final products of the chemical side of this integrated plant.

Elsewhere uses have been developed for "fly ash", the residue from the burning of pulverised coal, which gets carried along long distances into the flues. Hitherto it has had to be dumped. Designers of the process hope both to solve the problem of utility undertakings in disposing of this waste and to provide abundant supplies of a cheap construction material. A mixture of limestone screenings, fly ash and a small amount of hydrated lime has been developed for use as a base course for supporting a concrete roadway and to replace the limestone screenings normally used as the base for bituminous concrete roadway.

Other fly ash applications include its use in insulating cements, building brick and in steel foundries to provide hot strength for core and moulding sand, as a replacement for silica flour. The British Electricity Authority recovers fly ash and is able to dispose of some to manufacturers of building materials, but only in amounts representing a small fraction of the quantity available.[16] From certain flue dusts—notably those from coals of the Northumberland and Durham coalfields—the rare metals germanium and gallium are being extracted. No longer just a scientific curiosity, the former metal is being used in a new range of non-vacuum electronic valves as a crystal detector.

Some of our current British problems in using or up-grading wastes prove, on further inspection, to be in fact world problems. Some of them have proved very intractable, while for others solutions have been developed but not applied. Earlier reference was made to the world danger involved in the present rate of use of sulphur. Fortunately, there are some small signs of attention being paid to its recovery.

Sulphur in Coal

Sulphur occurs as the free element in deposits in Sicily and Louisiana. More widely dispersed, it is present combined with many metals in their ores and in various forms in coal. In Britain, the three million tons of sulphur present in the annual coal output represent roughly ten times as much as is actually used for sulphuric acid production in this country. Unrecovered, it represents not only a direct loss of material, but also an important indirect loss due to the corrosive havoc it wreaks on building materials and textiles. Yet at present only about 100,000 tons of the element are recovered, and this is mainly in the course of purification of coal gas.

This sulphur is used for sulphuric acid manufacture. At Fulham power station a flue gas washing process was installed which recovered sulphur in the form of calcium sulphate dihydrate sludge, which is identical with natural gypsum. However, the sludge was not marketable except occasionally in small quantities. Also, during the war, when the authorities asked for the creation of smoke in the

London area, the process was suspended by official order and has not been reinstated.[16]

A particularly ingenious process, which was operated before the war at a Manchester gas works, combined sulphur recovery from flue gases with ammonium sulphate manufacture.[5] Calcium sulphate is prepared by a chemical route similar to that used in the Fulham process. The combustion gases are treated with a chalk suspension forming calcium sulphite, which is then oxidised to the sulphate. The latter is circulated instead of water for washing the ammonia out of coal gas. In the presence of the CO_2 also present in coal gas, ammonium sulphate and calcium carbonate are formed. The former is recovered and the latter returned to the flue gas washer. Thus the process is cyclic and continuous.

It is clear that the processes exist which can be applied at any large coal consuming plant, such as power stations, gas works, large factories and even large blocks of flats, but that they are scarcely being applied.[6]

Another British problem is that of finding a use for rubber dust. When tyres are re-treaded the old heavily loaded and aged rubber residues of the old tread are ground off. Finding an application for the resultant rubber dust has so far proved impossible. Equally intractable has been the problem of sawdust and chips. These have been considered and used for loading linoleum, for making synthetic board and (with special adaptation) for firing boilers. The Fuel Research Station (DSIR) has even published a pamphlet listing abstracts of all reported and suggested uses; but still the surplus piles up at the rate of many thousands of tons each year.

Sawmill Waste

However, there may be hope in a very recently announced Australian process. Chemical treatment of bark and sawdust mixtures of white cypress pine, *Callitris glauca*, has been effective in yielding a much more valuable product. The Australian workers report that, on treating this waste material with small quantities of para-formaldehyde at moderate temperatures and pressures, a new type of board was produced. Equal parts by weight of sawdust and ground bark were heated at 140° C., with 1 per cent of paraformaldehyde for three minutes at 180 p.s.i. The resultant board, similar in properties to many fibre boards, is considered so promising that the process is regarded as a possible solution to the problem of using Australian sawmill waste. Other commercial timber species have also given good results.

Paper mill sludge, also already referred to as a world problem, has proved equally difficult to deal with in Britain. The trouble, as old as paper-making itself, arises from the fact that the waste consists of 80-85 per cent water. The solids are 31 per cent organic and the remainder inorganic. Modern plants do not yield this refuse, but the many old plants in the country continue to add to depressing acres-wide " lakes " of this sludge.

Wax from Peat

At the Fuel Research Station attempts have been made to develop a practical process for extracting wax, by means of suitable solvents, from peat and lignite. This is strictly an up-grading process, since these materials are used at present only as low-grade fuels. Lignites occur in appreciable deposits only at Bovey Tracey (Devonshire), but there are, of course, peat moors in several parts of England and Scotland.

German lignites are reported to be yielding about 10 per cent of a crude ester wax using benzene or benzene alcohol as solvents. Benzene extraction has also been successfully carried out on the British lignites, giving a yield of 4.4 per cent on the semi-technical scale. A very similar wax has been obtained from peat, except that the melting point is a little lower and the acid value somewhat higher. Results of the experiments are still in doubt. Technically, the process presents little difficulty, but the prospect of successful competition with imported waxes is very uncertain.

Another interesting salvage possibility which has been proposed is that of recovering methane gas by anærobic digestion of alcohol distillery effluent liquors. It has been claimed[17] that by this process these effluents could be made to furnish the entire fuel requirements of stills of the vacuum type or two-thirds of the steam requirements of an ordinary two-column still.

In the sphere of extracting valuable materials from natural resources, as distinct from industrial waste, great strides have been made in seaweed research. Lord Bilsland, Chairman of the Scottish Council (Development and Industry), however, recently expressed the fear that others might be quicker than the Scots in taking advantage of this research, and this despite Britain's five years' start on every other country. Accurate figures

are not available, but the output of the British alginate and algæ producing firms is estimated to be worth about £700,000 per year. There is available each year no less than one million tons of suitable dry seaweed from the coasts of Scotland.

In considering the long-term aspect, one author has suggested[14] that all processes be assessed from the standpoint of conservation, and not only as a matter of money economics. He proposes an index called the 'conservation quotient", abbreviated to *cq* and defined by this simple equation:—

$$cq = \frac{\text{weight of replaceable or inexhaustible material}}{\text{total weight of materials used in the manufacture}}$$

It will be seen that he has included "inexhaustible" material, which evidently is meant to cover such gases as oxygen from air or salts from sea water, where for all practical purposes the sources really are inexhaustible. If this came to be applied, all suggested processes would be considered not only from the standpoint of money economics, but also of the effect on world resources. Thus, the conservation quotient of electricity made in a coal-burning power station is zero. Only irreplaceable coal has gone into its manufacture. On the other hand, the cq of electricity generated by a waterfall would be nearly one. It would be less than one only by the amount representing the wear on the equipment—the depreciation allowance, as it were.

Furthermore, increasing interest is being shown by a number of workers who are thinking of conservation, or even creation of resources, in the remarkable synthetic activity of micro-organisms.[15] For instance, a 1000 lb. bullock has been estimated to produce one pound of protein in 24 hours. A similar weight of soya bean seed yields 86 lb., and *Torulopsis* yeast gives about 4000 lb. Similarly, the marine algæ, such as the non-buoyant seaweed typified by the *Laminaria*, can produce carbohydrate (by photo-synthesis) at twice the weight per acre of the average forest.

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British Valves for Oil Industry

THE growth of British engineering's contribution to the oilfield equipment around the world is recalled in a survey by M. J. Danckwerts in the *Shell Magazine* (Vol. 30, September) of the specialised processes and plant now being employed in several progressive centres for the production of large high pressure oil valves in this country.

Recognition is paid to the rationalisation which the British Standards Institution is contributing to this relatively new industry through its Petroleum Equipment Industry Standards Committee, which for five years has been formulating specifications for valves, which have hitherto been made either to the specification of the customer, or those of the American Petroleum Institute, or a compromise between the two.

The new specifications, based on existing specifications, have been so enlarged and improved as to produce a valve thought to be as good as any before, but with a far greater degree of interchangeability. Even such details as the fit of the hand-wheel on the spindle have been taken into account; so that if the handwheel of a British Standard valve breaks a replacement from any other British Standard valve can be used. Only some of the earlier specifications have so far been published; work is going ahead with others, and in time all usual types of valve will be included.

The BPM Laboratory at Amsterdam plays a large part in controlling the quality of valves used within the Shell group; besides analysing the substance and construction of sample valves. It also undertakes long-term research into metallurgical problems encountered in the manufacture of valves. For some months past, for example, an investigation has been going on into the reasons why the 24-hour kerosine test very occasionally fails to reveal a slightly porous body.

PHENOLS FROM HYDROGENATION OILS

Success of German Methods

THE demand for phenols in Germany until about 1980 could be comfortably met by the existing plants for the production of synthetic phenol and for the removal of phenols from coal tar oil fractions. During the next decade, however, industrial demand increased to such an extent that the old sources ceased to be adequate and the development of new sources daily became more necessary.

Three processes were tried at Leuna and are described in Report No. 0008, recently issued by the Coal Tar Research Association Intelligence Section, which is a translation of a paper on this subject by Dr. Bemmann, of the Ammoniakwerk, Merseburg.

A potential source for Germany was provided by the phenol-containing waste liquids from coke plants, low temperature carbonisation plants and hydrogenation plants. The phenols from refining hydrogenated petrols also provided a rising source of materials as hydrogenation plants were extended. Yet even these new sources were not nearly sufficient to satisfy the ever-growing demand.

Synthetic Production

Germany was therefore obliged to consider an extension of the synthetic manufacture of phenol. The raw material, benzene, was not available in unlimited quantities and was urgently needed as a fuel. Moreover, no phenol homologues, like the cresols and the xylonols, are produced by this method. However, large quantities of ready-made phenols were contained in the l.t. tars, which were being produced in ever-increasing quantities, and in certain hydrogenation products. In the years before the war, therefore, efforts were made to devise suitable processes for the recovery of phenols from such oils.

The l.t. tars are not suitable for extraction in the form in which they are commercially found, since they form emulsions with the extraction liquids, which are difficult or impossible to break. The light fractions of the tars are, however, often easy to use. These fractions, with boiling points generally between 200 and 300° C., have a density and viscosity low enough to permit the rapid settling of the extraction liquids. Also, they contain the valuable low-boiling phenols in enriched proportions compared with the tar, so that, for the recovery of a given quantity of phenols, only a comparatively small amount of liquid need be worked up. This correspondingly reduces the size of the plant required.

Most l.t. carbonisation plants deliver their product to the hydrogenation works in the undistilled state in which it is collected. However, in many l.t. carbonisation plants the collection of the material itself involves a certain amount of fractional condensation of the tar. The main bulk of the material is obtained as a high-boiling thick tar, and a small portion of the total product accumulates as a middle oil-like thin tar and as a light oil. Quite often these separate products immediately re-mix together and in some cases this is only done at the hydrogenation plant.

Light Condensates

In general, no difficulties are encountered in the dephenolation of the light products before they are mixed with the thick tar. The boiling ranges of the individual fractions overlap considerably, so that the thick tar contains certain quantities of the low-boiling constituents which yield valuable phenols. However, the main bulk of the phenols is found in the light condensates in enriched proportions, so that, according to the nature of the coal. the l.t. carbonisation process used, and the conditions of condensation, about 5 to 15 per cent low-boiling phenols are obtained, together with varying amounts of higher-boiling acid oils.

Extraction Processes

The varying ratio of phenol to cresols depends mainly on the nature of the coal. For instance, most brown coal tar oils contain considerable amounts of phenol. The thin tars and light oils from l.t. carbonisation plants may often be used for the recovery of phenols by suitable extraction processes. They are easily and rapidly separated from the extraction medium, especially if they are worked up in the state in which they are collected, so that they have not been aged or brought into contact with the air. However, especially at those l.t. carbonisation plants which used old-fashioned methods, products were found which formed disagreeable emulsions with the extraction liquids and were thus unsuitable for dephenolation. Preliminary tests were

therefore necessary to ascertain whether the products of a given plant were suitable for extraction.

Apart from the l.t. tars, other potential sources of phenols were in certain oils produced by the direct hydrogenation of coal. These are formed in the liquid phase and represent an intermediate product in the production of fuel. They are only partially saturated with hydrogen, and in addition to nitrogen-and-sulphur-containing compounds, among them low-boiling phenols. To obtain useful fuels the liquid phase oils must be further hydrogenated in the vapour phase. For this purpose the liquid phase oils must first be separated into distillate and residue in a manner similar to the hydrogenation of tar oils. This distillate resembles the tar distillate so far as the content of phenols, the viscosity and the density are concerned, but for the purpose of phenol recovery it presents an even more suitable starting material.

Hydrogenation Oil

The coal liquid phase oil which has been submitted to treatment with hydrogen is considerably less contaminated with the materials interfering with extraction, such as emulsion formers and carboxylic acids. Moreover, calculated on the basis of the original phase, hydrogenation oil is a far richer source of phenols than is the tar. It has been shown that with coal, 73 times as much phenol-cresol mixture is obtained by pressure-hydrogenation as is obtained by high temperature coking. Similar, though not quite so arresting, is the relation between phenols obtained by l.t. carbonisation and hydrogenation. Direct hydrogenation of brown coal gives 10 to 20 times as much phenols as does its l.t. carbonisation. Phenols can thus be obtained from coal hydrogenation oils not only more easily, but also in considerably greater quantities than from the tars.

At Leuna an attempt was made to devise a process in which the pure acidic oils could be continuously recovered from the hydrogenation oils. It was desirable that the recovered oils should be completely soluble in dilute lyes; that is, free of neutral oils. Moreover, only the phenols were required to be extracted from the oils, which covered a fairly wide boiling range and, in addition to the valuable low-boiling phenols, also contained more or less large quantities of higher-boiling acidic compounds. Thus the extraction agent should, if possible, act selectively. The methods tried at Leuna were the hot water process, the sodium sulphide process, and the caustic soda counter-current process.

The hot water process uses as the extraction agent water at temperatures at which the solubility of the phenols is high. The subsequent separation depends on differences in solubility with temperature. The water is saturated at about 250° C. The oil-water vapour pressure relations prevailing give a working pressure of about 50 atmospheres. The most suitable quantity ratio is 2:1 of water to oil.

To make the process more economical a good heat exchange is desirable. An orifice mixer is used and other instruments are: a preheater each for oil and water; separate coolers for oil and water; and high and low temperature separators. Water is circulated continuously, and for the recovery of the phenols, use is made of the 23 gm. solubility difference between 35 gm./litre at 250° C., and 12 gm./litre at 25° C.

Before the crude extract oil may be used as phenolic oil it must undergo further treatment. First, it is topped and the higher boiling equipments are removed as residue. Its quite considerable content of neutral oil is then removed, after which it is ready for use. From the operating point of view this process has proved quite satisfactory, but it leaves much to be desired in the purity of the phenol. At 250° C. water is very much less selective than at room temperature, and its affinity for neutral oils rises far more steeply with temperature than does its affinity for phenols.

Sulphide Process

The sulphide process is based on the fact that at about 100° C. phenols will dissolve in sodium hydrosulphide lye, with evolution of H_2S, and that the phenols may later be regenerated from the solution by gassing with H_2S. Thus, phenol-containing oils are extracted in an agitator, or similar apparatus, with a solution of sodium sulphide at about 100° C., the dephenolated oil being then separated from the phenolic lye by allowing it to settle in the separating vessel. Finally, the phenolic lye is treated with H_2S at about 50° C. in packed columns, separating off the dissolved phenol in the form of crude phenolic oil. The lye regenerated by the H_2S is recycled.

The hydrogen sulphide for the process is pressurised from a gasholder into the gassing column through a blower. After passage through the towers the unabsorbed gas is united with the H_2S liberated during the extraction, and is passed back to the gas holder. Both lye and gas thus form closed systems. The only losses are due to leakage and solu-

tion of the gas and the lye in the end-products.

The crude phenol oil is practically free of neutral oil and can be separated simply by distillation. It contains considerably more low-boiling phenols than the phenol oil obtained from the same starting oil by the hot water process. This is because the weakly alkaline sodium sulphide lye selectively dissolves the more strongly acid, low boiling phenols. For instance, if in the oil to be phenolated the ratio of low-boiling phenols to high-boiling acid oils is 1:4, then in the crude phenol oil obtained this ratio will change to 1:2.

The third process is a development of the well-known method of extracting phenols from phenolic oils with caustic soda, treating the carbolate liquor thus formed with CO_2 to precipitate the dissolved phenols, and then causticising the carbonate lye with lime. The lye generated in this way is then re-circulated to the extraction stage.

The further development consists in effecting the extraction counter-current wise. It was found that, instead of using an extracting column, the process gained by being operated on a cascade-type counter-current basis. Three stages are generally sufficient. As compared with the single-stage stirring, considerable economy of lye is achieved, since the lye selectively dissolves the more strongly acid low-boiling phenols, while the more weakly acid high-boiling oils remain undissolved. The selective action of the lye is evident, even in the low boiling phenols extract, for phenol in its turn is dissolved preferentially to the cresols and the xylenols.

Evaporation Plant

This process also produces phenolic oils practically free of neutral oils, so long as the caustic soda lyes used are not stronger than 10 per cent. If the phenol oils are required to be absolutely free of neutral oils, and completely soluble in dilute lye, then an evaporation section for purifying the phenolate lye must be incorporated. Should the oil to be dephenolated contain appreciable quantities of dissolved acid gases like CO_2 and H_2S, these would require to be removed before extraction, by treatment with an inert gas.

The caustic soda stepwise counter-current process operates under ordinary temperature and pressure. The consumption of energy is restricted to the fairly low consumption of the pumps. No corrosion problems arise. The extraction plant is not expensive, consisting mainly of thin-walled containers and ordinary centrifugal pumps. The only unsatisfactory feature of the process is the comparatively complicated and expensive regeneration of the carbolate lye by causticising with lime. It was suggested that the American proposal (Pat. App. K.147,049, Koppers Co.) to decompose the carbonate lye by electrolysis might be a better solution of this problem.

Detrimental Impurities

As regards the effect of dephenolation on the subsequent treatment of the tar oils or the hydrogenation oils, this generally consists of hydrogenation in the vapour phase over solid catalysts because any impurities in the oils, especially inorganic non-volatile materials, are detrimental. The dephenolated oils must be carefully freed of entrained lye by allowing them to settle or by centrifuging. Oils containasing dissolved inorganic materials, such as alkali phenolate, must be thoroughly washed with water or redistilled.

The reduced phenol content of the oils may influence the hydrogenation itself. For example, the hydrogen requirement may be less than that of the untreated oil, since the highly unsaturated phenols are absent. The heat of the hydrogenation reaction also will be less, which in certain circumstances may be advantageous. Finally, for the action of certain hydrogenation catalysts a reduced content of phenols may be beneficial. Against these advantages must be set the fact that fuels produced from dephenolated oils have a slightly lower knock rating.

Apart from the valuable low-boiling phenols, the crude oils contain considerable quantities of water, benzene, high-boiling acid oils and, as with the oils extracted with lyes, traces of alkali. These substances are removed by distillation, water and benzene being the first runnings, and the low-boiling phenols the main fraction. The high boiling acid oils, together with the inorganic residues, remain as distillation residue. The main fraction is either used as such or divided by further distillation into phenol, cresols and xylenol mixture.

The quality of the phenols obtained from l.t. tars and from liquid phase hydrogenation oils is inferior to that of phenols obtained from h.t. coal tar, mainly on account of the comparatively high content of sulphur compounds. Their purity, however, is sufficient for many purposes.

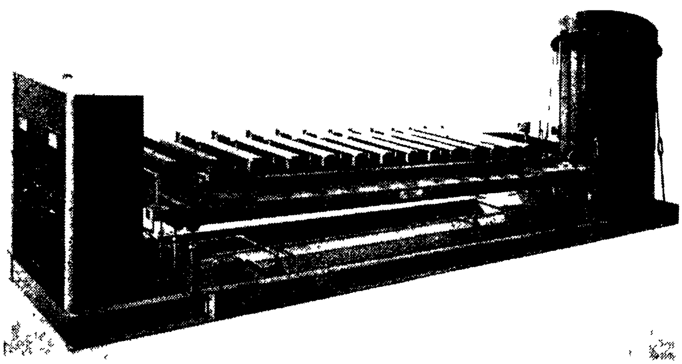
In general, the problem of the recovery of phenols from l.t. tars and liquid phase hydrogenation technically had been solved to a great extent when war broke out, though individual aspects such as the corrosion problem were not clearly defined.

U.S. Design for Small Chlorine Supplies

Economical Source of Some Essential Chemicals

THIS installation represents the U.S. solution of the problem of providing in a small compass a means of supplying principally chlorine or caustic soda wherever small quantity supplies are needed. It occupies a space of 3½ ft. by 25 ft. The unit consists of a highly developed mercury cell complete with denuder, a power rectifier, brine preparation tanks (arranged vertically), brine recirculation equipment, caustic receiving tank, etc., mounted on a single foundation.

In the unit assembly may be included auxiliary apparatus to convert the chlorine into one of several derivatives. An automatically operated absorption tower, with the addition of lime water, produces a solution of calcium hypochlorite.



By courtesy of Amroc, Inc., New York

Another alternative is a small unit to produce hydrochloric acid which uses the hydrogen, also produced by the principal plant itself, as well as the chlorine. The 24-hour output is stated to be not less than 225 lb. of 100 per cent caustic soda, 200 lb. of chlorine, and 5 lb. of hydrogen.

The production of 1000 lb. of 100 per cent caustic soda, 886 lb. of chlorine, and 25 lb. of hydrogen needs 1500 lb. of salt and about 1296 kWh.

Modernised Oil Production

THE Government of Ceylon has given a contract to the chemical plant division of Blaw-Knox and Co. of the U.S.A. to supply a fat-splitting plant to be installed in Ceylon. It will employ a continuous high pressure process and give a splitting efficiency above 98 per cent. Using no catalysts and a large measure of automatic control, it will produce fatty acids from coconut oil at the rate of 1500 lb. per hour. It will also be used to upgrade low-cost fats and greases.

The project is part of an extensive Government programme in Ceylon to modernise production of fatty oil. It will provide for solvent extraction plants, glycerin concentration, fatty acid distillation, refining and deodorising edible oils, production of mixed animal feeds, lauryl alcohol manufacture and soap production.

The price of coconut oil in the Colombo market has risen by as much as 30 per cent since the outbreak of the Korean war. Large quantities have been exported.

U.S. Aid for Italian Fertilisers

ITALY'S leading chemical combine, the Montecatini group, is reported to have applied for an ERP credit of $7.5 million to cover part of the cost of purchase, in the U.S.A , of machinery for a large new fertiliser works in Lodi, near Milan. As raw material, the plant is to utilise methane gas, which occurs abundantly in the Po Valley, to produce 180 tons of synthetic ammonia per day. Of this total, 45 tons are to be used within the plant itself for the manufacture of synthetic fertilisers, while the balance will be supplied to other fertiliser-manufacturing units for the Montecatini group. The introduction of the new process may effect a saving of 70,000 tons of coal and 150 million kWh of electric energy yearly.

Growing Total of Middle East Crude Oil

Middle East oil output, according to the Standard Oil Co. of New Jersey, has risen by 500 per cent since the end of the war and may soon exceed 2 million bbs. daily.

FLUORINE IN WOOD PRESERVATION

Report on Recent Work in Germany

THE comparatively full information which Allied intelligence reports (BIOS, etc.) have given on wood preservative preparations in Germany, has been usefully supplemented by a further report by Dr. G. Becker, of the Berlin-Dahlem Materials Testing Station (*Angew. Chem.* 1950, *62*, 382-385—21.8), dealing particularly with fluorine compounds.

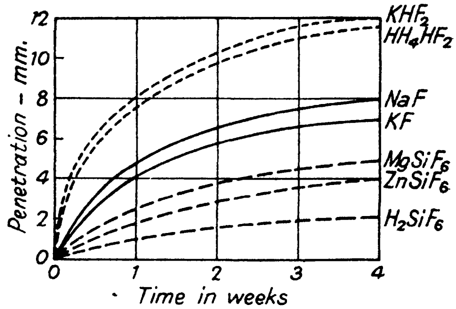
The value of fluorine and fluo-silicon compounds against various forms of mould, used either alone or more frequently in combination with other materials, is well known. Their usefulness in this respect is probably only exceeded by some mercury and thallium compounds, and in certain cases by arsenic preparations. A combination of the fluorine compounds with those of arsenic, in the so-called UA salts, is doubtless one of the most effective, especially against risk of washing out; a bichromate, and perhaps also dinitrophenol, should be included in the formula.

Reference is made in the German report to a forthcoming publication by G. Theden on this washing-out resistance of wood preservatives (*Elektrizitätswirtschaft*) now in the press. Results of tests with a large number of wood preservatives, including thallium salts, fluorides and fluosilicates, have been recently reported in the *Wiss. Abhandl. Deutsche Materialprufungsamt* (Trans. German Materials Testing Station) 1950, III, i, 40-62 and other German publications and some of this work is reviewed here.

Krieg and Pflug Method

Penetration and toxicity are among the most important characteristics to be studied. In studying penetration, it is customary, in accordance with German standard No. 52618, to employ the Krieg & Pflug (Rutgers Laboratories) method for sodium fluoride, using the zircon-alizarin reaction (*ibid* pp. 84-103). This has been done for several fluoride or fluo silicate compounds, using soft pine as test wood, stored for one to four weeks in moisture-saturated atmosphere under reagent conditions showing 0.5 per cent NaF limit. Results are graphed as shown in diagram herewith.

It was evidently desirable to examine the reasons for the differences shown by the two groups, fluorides and fluo-silicates, more especially in regard to colour change in the Zr-alizarin reaction. Experiments with filter paper and wood showed, in fact, that a salt concentration two to five times greater than with the fluorides was required to obtain the same colour change with the individual fluo-silicates.



The Fluosilicates

It is probable that with both groups there is about the same initial penetration, but it appears less with the fluosilicates because the Zr-alizarin reaction in this case only becomes evident with greater density of protective medium. The deeper penetrations of the hydrogen fluorides can also be explained, being apparently due to more vigorous formation of HF (gaseous) than with other fluorine compounds. This was, indeed, confirmed after much experiment, including a method for determining the gas effect separately from that of the liquid.

The tests included some with very dry wood. If HF gas is within the wood it must also be escaping to the outside, as can be noted from darkening of glass or corrosion of metal at greater or less distance from the salt or treated wood. It also forces its way through air into other wood, and in sufficient concentration can be detected by the Zr-alizarin reaction. The wetter the wood the more quickly it will escape from it.

Gas penetration into wood was also investigated over twelve monthly periods. It was quicker during summer than winter, using acid or hydrogen fluoride preparations. In discussing the effect of this gas on the wood the author points out that a gas penetration corresponding to 0.5 per cent NaF—according to the Zr-alizarin

reaction — gives adequate protection against mould and insects.

From the tests made it is evident that the HF must be combined in the wood in some form, otherwise it would be difficult to explain the prolonged stability of the chemically and biologically indicated fluorine content. It has been clearly shown that destructive moulds and insects in wood can be killed with gaseous HF. This, of course, has long been known, but unfortunately the gas is dangerous to deal with. In special cases and in skilful hands it can be used to advantage either in aqueous solution or as gas.

The next point considered is the effect of fluorides and fluo-silicates in corroding iron (nails, screws, bolts, etc.) used in woodwork. Neutral or slightly alkaline fluorides are known to have no destructive effect on iron; they may in fact be protective, but the fluo-silicates, and still more markedly the hydrogen (acid) fluorides, accelerate corrosion. This is exemplified by tests made with different wood preservatives in which zinc fluo-silicate is the only constituent or the principal one, also by comparative tests in which fluo silicates were used (Mg, Al, as well as Zn). The notable exception among the acid fluorides was that of potassium (5-20 per cent) in the so-called " screw test ": its curve nearly coincided with that of NaF.

By addition of suitable proportions of KHF_2, or of an alkaline monofluoride, the iron corrosion accelerating effect may be eliminated. Recent research at the Berlin-Dahlem station has shown, however, that only for the potassium monofluoride can this be properly claimed. It is further pointed out that the so-called Standversuch (still test) in glass vessels may lead to false conclusions.

In studying the effect of the gas evolution of fluorine wood preservatives on iron, KHF_2 may act unfavourably, and this is also true of mixtures with the NH_4 salt. It is, however, possible that the evolution of ammonia, which can be readily detected, may have some protective action against the aggressive HF acid. In any case, it is of great practical importance that some means should be found of reducing or eliminating the corrosive action of the fluo-silicates and at the same time retaining their valuable toxic properties and improving their penetrative power.

Manganese Steel Plates for Chemical Grinding

GRINDING of chemicals and other substances in ball and tube mills, of which the duration of serviceability depends largely upon the resistance of the liner material, is a familiar operation in many phases of chemical and mineral industries. Manganese steel is known to possess great toughness and under impact develops greater surface hardness. It has, therefore, in several respects been regarded as one of the most suitable materials for liner plates.

Research conducted by Edgar Allen & Co., Ltd., however, suggests that the ductility of manganese steel used for this purpose may operate unfavourably.

A current report by the company observes that under impact the working surface of the plate not only hardens but also expands laterally, and since the outer face of the plate, resting against the shell, is not subjected to hammering, distortion of the plate is liable to occur. The centre of the plate tends to lift away from the shell thus putting a big strain on the fixing bolts, which were liable to break as a result. This spreading of the manganese steel might also give rise to difficulty in the removal of worn liners, it was thought.

This disability has to some extent been overcome by metallurgical research, and a special manganese steel can now be purchased giving less tendency to warp without unduly decreasing its toughness.

Investigations were also made as to methods of decreasing the area of the plate subject to blows and at the same time increasing the intensity of the blows. These ends are said to have been achieved by a series of steps resulting finally in an improved stud liner plate. In this the hammering action of the grinding media falls on a number of stud projections forming the inner surface of the liner plate. The tops of these studs are heavily pounded, thus increasing the hardening of the manganese steel and consequently the life of the liner. Since each separate stud head can expand freely, distortion of the sole plate is avoided.

Cavities are provided in the under side of the sole plate immediately below the stud projections. These cavities have also the desirable effect of reducing somewhat the dead weight per square foot of liner plates, as compared with many other existing types of liners. At the same time the maximum thickness of metal is retained at the points of maximum wear.

The plate is covered by U.K., Indian and Pakistani and Argentine patents, and others are pending.

Technical Publications

THE British Welding Research Association has issued " Recommendations for the Standardisation of the Radiographic Examination of Welded Joints in Mild Steel Pressure Vessels "(1s. 6d.) collating the findings of a specialist committee. The latter's intention was to provide a direct practical lead towards a uniformly high standard of radiographic procedure in British industry. An important conclusion is that the interpretation of radiographs is the proper function of a person trained in radiography, and there is no justification for making the untrained engineer or inspector responsible for interpreting radiographs. His province is to assess the significance of the defects pointed out to him by the trained radiographer.

The recommendations cover plant, protection of personnel, radiographers, radiographic technique, numbering and interpretation of radiographs.

* * *

THE reprinting in booklet form of the article entitled " The Use of Wetting Agents in Fire Fighting," which originally appeared in the *FPA Journal*, lends emphasis to the findings published earlier that wetting agents may assist in suppressing heath fires but do not materially affect the action of water in other fires.

* * *

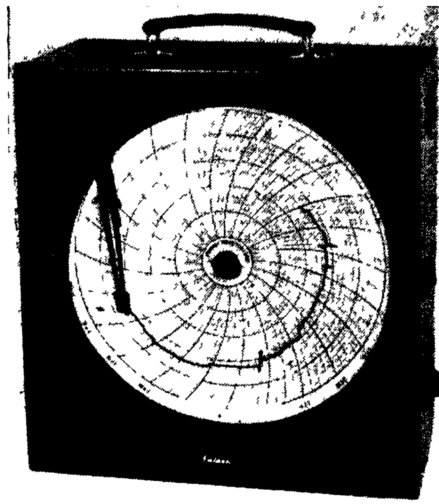
THE work of the Road Research Laboratory of the Department of Scientific and Industrial Research which was formed in 1933 to study problems in designing, building and maintaining highways, has been described in many publications. All these up to the end of 1949 are now recorded in the " Index of Publications of the Road Research Laboratory, 1933 to 1949 " published for the DSIR by HMSO, price 1s. (U S.A., 30 cents).

* * *

THE technical background and practical applications of capacitive heating—the heating of non-conductive materials by means of the dielectric losses occurring in them when they are placed in an electric alternating field—are described in one of the feature articles appearing in " Philips Technical Review."

* * *

DETAILED descriptions of the stainless steel sanitary fittings in the wide range made by the A.P.V. Co , Ltd., are contained in its latest illustrated catalogue. Listed are numerous items particularly suited to the dairy and other potable liquid industries.



By courtesy of Fielden (Electronics), L

A portable electrical graph recorder for test room or laboratory (Model RL1) which operates on the Servograph system. It may be used in any circuit which provides enough energy to operate the equivalent indicating meter

New Measure of Standard Length

TWO American scientists, of the Westinghouse Research Laboratories and the Allegheny Observatory are using radar bombardment and atomic energy in an attempt to produce a standard accurate to one part in 40 million, on which international measurements of length can be based. The present common standard is accurate to one part in 10 million.

The basis for the new standard is the wave length of light emitted from mercury artificially made from gold in the Oak Ridge atomic pile. A microscopic quantity of mercury is placed in a capsule with argon and bombarded with ultra-short waves. The mercury vapour emits a light which is broken down into wave lengths and recorded on a photographic plate. From this the scientists are able to determine how many light waves there are per unit length.

The international standard for the metre at present in universal use is the number of wavelengths or red light emitted from the element cadmium.

OVERSEAS CHEMISTRY AND INDUSTRY

INDUSTRIAL CAPACITY IN ISRAEL

Important Expansions of Chemical Production

by H. REIK, M.Sc. (Eng.).

THE first and abiding impression of the visitor to Israel is of urgency and impatience for industrial development. Each branch of industry has many possibilities of expansion and most are hampered by the lack of foreign currency for special equipment and raw materials.

Many pharmaceutical manufacturers are acquainted with the latest developments in manufacturing techniques and eager to apply these in their own plant. The manufacturing chemist is well aware of the advantages to be obtained from the use of modern equipment such as glass plant. Some firms are in fact employing the 20 litre sizes for pilot plant-scale production, and firms in Tel Aviv and Haifa use 50 and 100 litre flasks. This equipment frequently incorporates the Isomantle type of electric heating medium, affording gratifying evidence that the British product is being sought in spite of the fact that dollars for U.S. alternatives are available. The import licensing authorities have accorded priority to electric heating mantles. These will be used in relatively large quantities; gas is not generally available for industrial use.

British Deliveries Slow

Chemical plant of a simple type is being made by local manufacturers but orders for special vessels have been placed both with British and American manufacturers. The general disadvantage that British delivery has been slow compared with that of American manufacturers seems to have been partly overcome, although enamelled vessels still are ordered in the U.S.A. when rapid delivery is required.

Considerable ingenuity has been shown in making shift with some strange equipment. This reveals the difficulties confronting the manufacturing chemist, who cannot rely on laboratory furnishers to supply within a few days any items overlooked when planning a new department, or to replace broken or damaged apparatus. The importance of glass plant has also been recognised by the authorities and facilities exist for students of chemistry at the Haifa Technical College to specialise in glassblowing. The first graduates of this course have already established a small but flourishing industry in special laboratory and some industrial glass ware.

A new factory for glass products is now being established near Petah Tiquah. This plant will be equipped with the most modern American machinery but will not produce high temperature flasks. For a long time to come Israel will have to rely on the Pyrex and Hysil type of plant and Great Britain has the opportunity to establish common standards with the American producers, whose goods have been used to a large extent.

A few firms are trying to get import licences for a stock of standard glass plant which should improve matters. Standard glass products, glass sheets, window glass etc., are being made by the Phoenicia glass works, near Haifa. This plant is now being extended. It is hoped that this work will double the capacity of the existing firms. This applies, of course, not only to the pharmaceutical but also to the general chemicals section of Israel industry.

Refining has begun again at Haifa. though only a small part of the full capacity is being used. The oil comes by tanker, from America and the Persian Gulf via the Cape of Good Hope, because Egypt will not allow Israeli imports through the Suez Canal. The by-products from the refineries will be used in the manufacture of a number of petroleum based goods. These will replace imports and thus release foreign currency for capital goods.

Ready Market for Detergents

Typical of these petroleum products will be soapless detergents. Because the use of tallow is contrary to Jewish religious principles Israel cannot take advantage of this relatively cheap by-product of the meat industry but must instead use vegetable oils as a base for natural soap. These oils are not only more expensive but also have better uses, in food and paint. A ready market exists in Israel for synthetic detergents made from petroleum bases. The use of these detergents is furthered by the fact that Israel water is hard, being 484 ppm. in Haifa and about

500 ppm. in Tel Aviv, which would result in the loss of at least 50 per cent of the soap's effectiveness.

Some—but not sufficient—synthetic detergents are already being manufactured, partly from petroleum bases and from vegetable sources. It is planned to use sulphuric acid from the contact process of the Fertiliser and Chemical Company of Haifa to produce a 40 per cent active-60 per cent sodium detergent. This will then contain a minimum of imported raw materials, and, it is hoped, be competitive in price with fat-base detergents manufactured on the Continent.

The Government is investigating the possibilities of chemical industries based on the production of primary chemicals by the use of the Catarole process, as developed by Prof. Dr. Ch. Weizmann and Dr. Bergmann in co-operation with the Manchester Oil Refineries. This process is now being pioneered in Great Britain by Petrocarbon, Ltd. It yields the complete range of aromatics from oil, as shown by the following results which are based on a typical crude oil from the Middle East.

CHARGING STOCK IRANIAN NAPHTHA
(Percentages by weight of charge)

Gases	
Hydrogen	0.2–0.5
Methane	14.5–16.0
Ethylene	11.5–13.5
Ethane	8.0–10.5
Propylene	11.0–13.0
Propane	2.0–2.5
Butylenes and Butane	3.0–5.0
Liquids	
Prebenzene ...	0.1–0.5
Crude benzene	5.0–6.5
Crude toluene	5.0–6.5
Crude xylene	6.0–6.5
Cr. alkyl benzene	7.5–9.0
Cr. naphthalene oil	1.0–2.5
Alkyl naphthalene	3.5–5.0
Higher aromatics	1.5–2.3
Pitch	8.0–9.5

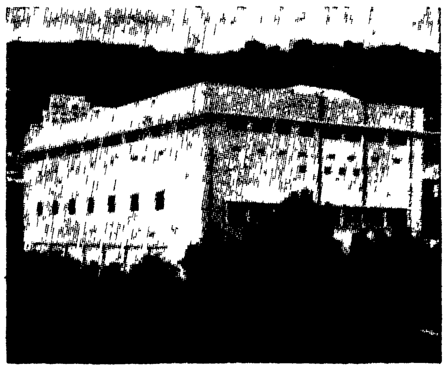
Publication of Weizmann Institute of Science, Rehovoth, Israel.

The use of this process represents a long-term plan and it is hoped that a sufficient supply of crude oil would eventually allow sufficient development in the chemical field to enable Israel to become the centre of chemical industry in the Middle East.

Classes in chemical engineering are now available at the Technical College in Haifa with this development in mind. A group of its students is now on a short visit to Great Britain to study British manufacturing methods.*

Among the many new enterprises the following are of interest to the chemical industry. Pressure Lubricants, Ltd., a British firm, is erecting a re-refining plant for used lubricating oils at Lydda—near the main Israel airport. The Treasury gave permission for the export of machinery from Great Britain as investment in Israel.

* Firms willing to enable such students to visit their works are invited to communicate with the author of this article, 18, Rosemount Road, London, N.W 3.



Physical, analytical and micro-chemical laboratories at the Hebrew Technical College, Haifa

The new Mollar-Dee textile corporation is erecting a spinning and dyeing plant for American cotton which, together with the ATA textile and dyeing works (at Kurdani), will be the most modern in the Middle East.

The Assis company, the largest canning firm in Israel, is doubling its canning capacity by extending the plant to include modern American machinery.

Co-operative Enterprises

While most of the Israeli industries are private concerns it is interesting to note that a fair proportion are owned or controlled by co-operative enterprises. One of these is the contracting section of the Israel Federation of Labour (a counterpart of the TUC) which controls, among others, the Palestine Portland Cement works "Nesher" near Haifa, the Phoenicia glass works and the Vulcan foundries.

The Phoenicia ampoule factory makes over 10 million ampoules annually, while Phoenicia, Ltd., of Jerusalem, specialises in glass blowing for scientific apparatus and laboratory plant. Accumulators and batteries are produced by another factory belonging to the Israel Federation of Labour which now runs plants in every branch of industry.

There is no real chemical industry in this sector yet. It could be easily started, however, by an enterprising firm supplying the technology and machinery, while the co-operative would supply labour, buildings and materials and management.

Bauxite Prospects in Jamaica

Composition and Potentialities of Deposits

THE possible development of bauxite deposits in Jamaica, estimated to represent between 200 million and 315 million tons, is suggested in a survey of Colonial mineral resources, just published.* The report indicates that, following war time investigations of the bauxite resources of Jamaica, interest is still focused on the likelihood of developing the mineral on a commercial scale.

Jamaica bauxite is a residual product derived by weathering of the White Limestone Formation. It is a soft earthy or shaly material, uniformly porous and predominantly dark red or yellow-brown. Grey, pink, purple or black ores are rare. Dark red or reddish black pisolites, generally less than ¼ in. in diameter, occur locally but are not conspicuous. Although highly porous (the crude bauxite contains 20 per cent free moisture) and readily powdered between the fingers when dry, the bauxite is strongly coherent in place. Mixed with lime, it makes a fairly compact mortar or cement and has been much used for rough building purposes since the early days of Jamaica.

Chemical Composition

The chemical composition of the Jamaican bauxite varies both laterally and vertically in the same deposit, and from district to district, but the following range in average composition may be taken as representative of many of the large deposits:

	Per cent
Combined water (H_2O)	26.0–27.8
Silica (SiO_2)	0.4– 3.5
Iron oxide (Fe_2O_3)	17.5–22.8
Titania (TiO_2)	2.4– 2.6
Phosphorus pentoxide (P_2O_5)	0.3– 2.8
Calcium oxide (CaO)	0.1– 1.2
Alumina (Al_2O_3)	46.4–50.3

Minor elements, totalling as oxides less than one per cent, are magnesium, vanadium, manganese, zirconium and chromium. In general, the iron content is slightly less in the yellow than in the red bauxite. The difference in colour is attributed to the state of hydration and particle size of the iron; yellow bauxite turns red when heated.

Mineralogically, the bauxite of Jamaica is composed chiefly of cryptocrystalline aluminium trihydrate, hydrated and unhydrated iron oxides and alumina-iron hydrogels. Aluminium monohydrate, possibly in the form of the mineral boehmite, sometimes occurs in appreciable amounts in the red bauxite, but is comparatively rare in the yellow bauxite. The silica is present mainly as disseminated clay minerals, the titania probably as hydrated oxides, and the phosphorus very likely as iron phosphate.

The advantages of the comparatively low silica content are unfortunately more than offset by the high percentage and physical condition of the iron oxides and the presence of phosphorus. It is believed that the state of the iron oxides is largely responsible for the poor filtration and settling characteristics which, together with the low alumina content, render Jamaican bauxite a low-grade ore. It is probably not amenable to beneficiation like most other tropical bauxites.

Although two or three small cargoes of bauxite have been shipped for experimental purposes, the mining of bauxite in Jamaica on a commercial basis has not yet been established. Recent reports, however, indicate that development may not be long delayed.

* "Colonial Geology and Mineral Resources," by H. R. Hose, M.A., F.G.S., M.A.I.M.M.E., The Quarterly Bulletin of the Colonial Geological Survey." Vol. 1, /, 1950. (HMSO 5s.)

Norwegian Aluminium Industry

THE Norwegian Government, which since the war has established a large aluminium works at Ardal, West Norway, is considering the building of a new aluminium factory further north at Sunndalsöra, near the large Aura power station now under construction. It is estimated the factory will have a capacity of 40,000 tons of aluminium a year. Norway is in a favourable position to extend her aluminium industry, having cheap and reliable all-the-year-round hydro-electric power. A Greek Government commission in Oslo recently offered to supply Norway with 40,000 tons of aluminium oxide a year.

Industrial Chemistry Conference at Milan

The 23rd Congress of Industrial Chemistry is to be held by the Société de Chimie Industrielle, in conjunction with the Società Chimica Italiana, at Milan, from September 17-23. The Congress is divided into 22 sections and over 100 papers will be presented.

GROWTH OF INDIAN INDUSTRIES

Investigations and Developments

THE State of Rajasthan has supplied 60,000 tons of gypsum since March last for the fertiliser factory at Sindri. This average supply of 450 to 500 tons a day is likely to rise to 2000 tons per day by the end of this year. Gypsum deposits occur at Jodhpur and in the Bikanir division of the State.

The fertiliser factory at Sindri will start full operations before the end of this year, and, it is estimated, the consumption of gypsum will rise to about 2000 tons per day by the end of 1951. About 1000 tons will be supplied from the Bikanir area and the remaining 1000 tons from Jodhpur, where the Government of India is now engaged in exploratory work.

An annual supply of 90,000 tons of gypsum to the cement industry of India also goes from Rajasthan. About 15,000 tons in addition are used locally for making building materials and plasters.

Eastern Chemical Fertiliser Industries

An article in the new *Quarterly Bulletin* for Asia and the Far East, published by the ECAFE, states that the two most needed materials for producing chemical fertilisers in the ECAFE region, namely, nitrogen and phosphoric acid, are produced only in India and China.

It notes the construction in India of a plant to produce 350,000 tons of sulphate of ammonia annually, and that other countries of the ECAFE region are also completing plans for establishing chemical fertiliser factories.

In view of the importance of chemical fertiliser manufactures, the article stresses the need for extensive geological surveys and notes that finance is the most difficult problem. It also predicts a substantial increase in the chemical fertiliser industry in ECAFE countries during 1951.

200,000 Tons of Chromite

Deposits of chromite, estimated at about 200,000 tons, are believed to exist at Naushal in the Keonjhar district of Orissa, India, according to officials of the Geological Survey of India. Chromite in India is mainly used for refractories and chemical purposes.

The Geological Survey of India undertook the investigation at the request of the Government of Orissa. The deposits occur in a one and a half mile band of rocks in the region. The nearness to the centres of the iron and steel industry and to the Calcutta port gives added importance to the deposits.

A recent photograph from the gas plant area showing the substantial proportions of the power plant installation

Further search for chromite and magnetite in the locality is proposed. A preliminary investigation indicated possible reserves of 500,000 tons of magnetite.

Camphor Proposals

Growing of tulsi plants for the manufacture of camphor is to be taken in hand in various parts of Madhya Bharat in India. Experiments carried out recently at the Forest Research Institute at Dehra Dun have shown that camphor can be manufactured from the ordinary tulsi plants. As a beginning, it is proposed to cultivate tulsi plants in the arboriculture nursery at Indore and then to distribute them to villages.

* * *

Three factories in Madras State are now engaged in the production of power alcohol, making use of the by-products of the sugar industry, such as molasses, and using bagasse, etc., for fuel.

* * *

The Government of India has decided to grant licences shortly for import from Aden to Calcutta of about 1 million maunds of fine salt.

• OVERSEAS •

Israel Penicillin for Rumania

A Jerusalem pharmaceutical plant is reported to have received orders from Rumania under an Israel-Rumanian barter agreement for penicillin to the value of $200,000. The fermentation material is being imported from the U.S.A.

Russian-Born Scientist Sentenced

Dr. Sidney Weinbaum, a Russian-born research engineer on a Government jet propulsion project at the California Institute of Technology until his dismissal last year, was sentenced to four years' imprisonment on September 12, convicted of swearing falsely that he had never been a member of a Communist organisation.

W. German Dismantling to End

It is officially announced that no further dismantling work is to be done in the British zone of Germany. The principal installations where demilitarisation had not be completed, but is now to stop, are the Blohm and Voss shipyards in Hamburg, the steel works building and former rolling mills at Watenstedt-Salzgitter, and the dry dock Elbe 17 at Hamburg.

Swiss Chemicals to Argentina

The Berne and Buenos Aires Governments' agreement for reciprocal trade valued at 235.8 million Swiss francs proposes that by June 30, 1951, Argentina shall import from Switzerland chemical and medicinal products valued at 31 million Swiss francs, as well as steel, machinery, motors, surgical instruments, precision instruments, and machine tools and textiles.

U.S. Developing Acrylics

The first commercial production of glacial acrylic acid, a derivative of beta-propiolactone and the basic of many synthetic chemicals, has been announced by the B. F. Goodrich Chemical Company, Cleveland, U.S.A., marking the company's entrance into the acrylic field. Manufacture will begin shortly at Goodrich's Avon Lake general chemicals plant. Although acrylic acid was first manufactured 100 years ago it has not been widely used in the U.S.A. and has been generally available only as a water solution. When it becomes available in the glacial or "dry" form, with over 97 per cent purity, it is expected to find wide usage in the plastics industry as a monomer, and in chemical industries as an intermediate for esters and other derivatives.

East German Dyestuffs

The Dyestuff Works Wolfen (Eastern Germany) is reported to have succeeded in producing dyestuff intermediates which had previously been imported from plants in the Federal German Republic. It is claimed that the fastness to light and water of the dyestuffs has been enhanced.

Deferred Action Against NHS

Chemists who were to cease to administer the National Health Scheme in Northern Ireland on September 30, as a protest against an 8 per cent deduction in payments for drugs and containers and for professional services, are to consider postponing their resignations until November 30.

Basis of Chinese Trading

State and private trading activities divide more or less equally the commercial activities of China, according to a Peking broadcast summarising the outcome of the recent conference between State trading concerns and private enterprises. It has been decided that the State should continue to monopolise certain metallic ores and bristles, limit its dealings in other major commodities, and leave the remainder to private merchants, whose scope would thus be extensive.

U.S. Molybdenum for Russia

Allegations that a United States shipment of molybdenum had been cleared by British Customs for re-export to Russia, despite its classification as a "strategic material" were made in Washington last week before a sub-committee investigating export control practices. In London, a Foreign Office representative stated that the cargo passed through British hands only for transhipment and re-export. It did not pass through the Customs or come under British control.

Austria to Fabricate Aluminium

An aluminium fabricating plant is in course of erection, with ERP aid, by the Austrian Metal Works, Ltd. (Oesterreichische Metallwerke A.G.) on the site of the Ranshofen Aluminium Works, Ranshofen. A unit for the manufacture of aluminium wire for high-tension electrical wire is already producing 18 to 20 tons per month of wire up to a diameter of 10 mm. An aluminium plate rolling mill may be completed this month. It is hoped that Austria will be able to pay for its bauxite imports by the export of fabricated aluminium.

• HOME •

Textile Conference

The Textile Institute is arranging a conference on yarn preparation, to be held at the Mechanics' Institute, Burnley, on October 26. Dyeing and preparation of yarn will be one of the principal topics.

Inquest Adjourned

The inquest on the two victims of the explosion at Monsanto chemical works, Cefn Mawr, on June 26, has been further adjourned to September 20. The men were William Ward, 39, a process worker, of Maesydre, Llanfyllin, and Richard Henry Biggs, 47, foreman process worker, of Church Street, Rhosymedre.

Unesco Order for Scottish Firm

W. B. Nicholson (Scientific Instruments), Ltd., of Glasgow, have secured and have nearly completed an order for Unesco, to supply science room equipment to schools and colleges throughout Europe. This type of work before the war was handled largely by German firms. Schools in Austria, Czechoslovakia, Poland and Bulgaria are among the countries which are receiving equipment. The firm moved in the early part of the year to a new factory at Thornliebank, near Glasgow and is developing its scale of production.

Welsh Uranium Prospects

Professor Alan Wood, of the Department of Geology at Aberystwyth, is of opinion that the uranium deposits found in North Wales are spread over a much wider area than was thought. He considers the deposit, in the black band division of beds consisting of soft, black slates, is 200 ft. thick and is not restricted to one farm or district. At present the deposit found cannot be worked successfully. The whole deposit may represent 1 million tons of rock, of which each ton would yield only about 80 gm. of uranium.

Plastics Plant Explosion

The cause of the explosion at the central laboratory at Widnes of I.C.I., Ltd. (THE CHEMICAL AGE, 63, 287), which killed a process worker and seriously injured another, was still unknown when the inquest was resumed at Widnes on September 8. An open verdict was returned on Mr. Frederick William Gard Morrin. Mr. Herbert Lawes, plant manager, said he visited the plant before the explosion and found the mechanism working satisfactorily. Dr. John Ferguson, research director for I.C.I., said Morrin definitely was not responsible for the explosion.

Tar Oils Fire

Bootle Fire Brigade were called out on September 8 to the premises of the Lancashire Tar Distillers, Ltd., Hawthorne Road, Bootle, when a still containing 5000 gal. of light oil ignited. By strategic use of water jets the firemen had the outbreak under control in 15 minutes.

Health of Atomic Workers

Possible dangers to the health of workers on atomic projects are to be discussed at a two-day conference in London next month arranged by the Institute of Biology and the Atomic Scientists' Association with the support of the British Association.

RAF Seeks Insulating Material for Runways

Because of the damage caused by jet aircraft exhausts to concrete runways the RAF is carrying out research at Cardington to find heat-resistant materials for use on airfields. It has been found that coarse tarmacadam is the most easily destroyed, while asphalt is more durable. Asbestos cement, though resistant to jet blast, did not stand up to the effects of moving aircraft and frost. Experiments are now being carried out on stronger insulating surfaces.

Scottish Gas Chemicals

Development of large plans for plant replacement by the gas industry in Scotland promise a comparable development of chemical by-products. In Glasgow plans have been announced for a substantial expansion at Dawsholm gas works. The chemical plant at this works handles crude distilling and passes oil to Provan for refining. The adoption of carburetted water gas production may have some effect here in reducing the volume of raw materials available for chemical processing.

I.C.I. Tubes Plant

Members of Whiston Rural District Council recently inspected the 50-acre tube-making factory which I.C.I., Ltd. is building on the fringe of the East Lancashire Road, at Kirkby. Mr. H. E. Jackson, chairman of the I.C.I. Metals Division, who received the visitors, said the site had been chosen on the advice of the Government, and furthered the policy of taking work to the workers. When the factory was complete there would be no more up-to-date plant and equipment would be bigger and more powerful than any in the world used for similar purposes.

PERSONAL

PROFESSOR NEILS BOHR, of Copenhagen, is one of the delegates from abroad who attended the international conference on atomic energy at the Clarendon Laboratory, Oxford, which ended on September 13. Also at the conference, which is the first large-scale meeting of its kind to be held in Britain, was PROFESSOR P. M. S. BLACKETT, of the Manchester University. Two British women scientists, MISS M. WALTERS, Birmingham University, and PROFESSOR KATHLEEN LONSDALE, of London, also took part.

MR. J. A. CORMACK has resigned from his position as director of studies at the Technological Institute of Great Britain. He will continue to prepare condidates for technological examinations and arrange courses of instruction.

The wedding was celebrated at Claughton, Birkenhead on September 9, of MR. IAN PROUDMAN and MISS AILSA DOUGLAS MACQUEEN. Both the bride and bridegroom are graduates of the University of Liverpool, the bride having a degree of M.Sc. in biochemistry, and the bridegroom a degree of B.Sc. with honours in mathematics. He is now a research student at Trinity College, Cambridge.

The Norwegian whaling magnate, ANDERS JAHR, has given another £40,000 to the University of Oslo in addition to a previous gift of £10,000. Of the £50,000, half is earmarked for the British Institute in Oslo, £17,500 for the establishment of an institute for experimental medical research, and £7000 towards the establishment of an audiological institute.

MR. J. S. COOK, an analytical chemist of Windsor, has been selected as prospective Labour candidate for Leicester. South East. He contested the Henley Division of Oxfordshire unsuccessfully in 1945.

The gallantry of COLONEL CAMILLE SAUTERAU, one of the aviation department of the Shell organisation in France, has been recognised by the conferment by the British Ambassador in Paris of honorary membership of the Order of the British Empire. The citation recalls his courageous collaboration with Allied operations after France had been occupied, from which torture and deportation under sentence of death to Buchenwald failed to deflect him.

SIR ALAN JOHN SYKES, Bt., of South View, Cheadle, Cheshire. chairman of the Bleachers' Association, Ltd., former M.P. for the Knutsford Division, left £186,364 gross (£185,669 net; duty paid £101,270).

NEXT WEEK'S EVENTS

SUNDAY, SEPTEMBER 17

Société de Chimie Industrielle

Milan: 23rd. Congress of Industrial Chemistry. Until September 23.

Società Chimica Italiana

Milan: 6th. National Congress of Pure and Applied Chemistry. In conjunction with Societe de Chimie Industrielle. Until September 23.

MONDAY, SEPTEMBER 18

The British Engineers' Association

Brussels: 3rd. International Mechanical Engineering Congress. Until September 23.

The Institute of Metals

Bournemouth: 42nd. Annual Autumn Meeting. Until September 22.

Netherlands Physical Society

Amsterdam: International Conference on Spectroscopy at Radio Frequencies. Until September 23.

TUESDAY, SEPTEMBER 19

Incorporated Plant Engineers

Glasgow: Engineering Centre, 351 Sauchiehall Street. 7 p.m. "Training of Apprentices for Plant Maintenance" by W. Derby, A.M.I.Plant.E.

Edinburgh: 7 p.m. "Water and its Treatment" by A. E. Brown, A.M.I.-Plant.E. Details of meeting place from W. Renton, 48 Broomhall Avenue, Edinburgh 12.

THURSDAY, SEPTEMBER 21

Society of Chemical Industry

London: University of London, Beveridge Hall. Plastics and Polymers Group Symposium. "Polymer Chemistry as Applied to Plastics." Until September 23.

FRIDAY, SEPTEMBER 22

Oil and Colour Chemists' Association

Liverpool: Exchange Hotel, Tithebarn Street. 6.30 p.m. Discussion meeting: "Advantages and Disadvantages of Alkyds." Three other lectures.

ASLIB

Bristol University: September 22 (evening) until September 25 (morning). Annual Conference.

Society of Leather Trades' Chemists

Leeds University: Chemistry Lecture Theatre. Annual Conference. September 22 and 23.

London BAC

The London section of the British Association of Chemists is to hold a social evening on Friday, November 10, at Williamson's Tavern, Bow Lane, E.C.4.

The Stock and Chemical Markets

A FEATURE of markets has been the expansion of business in mining and commodity shares, which were favoured as a "hedge" against the danger of inflation. Industrial shares, although firm, attracted only moderate attention. The TUC vote against wage restraint detrimentally affected some industrial shares. There has, however, been little selling, and leading industrial shares have shown firmness. In British Funds gains have been recorded. Proposals for further Colonial loan issue are anticipated.

Reports in the city indicate that many more important companies are in need of additional capital to finance development and expansion work and the higher cost of stocks, as reflected by Imperial Chemical's £20 million private placing and the Distillers Company's similar procedure for private £10 million of 3½ per cent loan stock. There will be no market dealings and no Stock Exchange quotation of either. The Distillers' stock is for a relatively short period and will be repaid in four annual instalments, starting 1956. British Celanese is among companies thought likely to raise more money before long; the annual results are due in a few weeks.

Chemical and kindred shares have shown a steady undertone this week, although Imperial Chemicals eased slightly to 41s. 9d. at which there is a yield of over 4¾ per cent on the basis of last year's 10 per cent dividend which is generally expected to be maintained. Fisons have changed hands around 26s. 9d., while Albright and Wilson 5s. ordinary units have further strengthened to 31s.

Monsanto Chemicals were 49s. 6d., Boake Roberts 30s. 3d., Laporte Chemicals 5s. units 10s. 6d., while W. J. Bush held their rise to 85s. 6d. Lawes Chemical were 10s. 6d., Amber Chemical 2s. shares 3s., Bowman Chemical 5s. 3d., and Brotherton 10s. shares firm at 20s. Pest Control were 6s. 9d., L. B. Holliday 4½ per cent preference 19s. 9d., and British Chemical and Biologicals 4 per cent preference 17s. 3d. Woolley 4¾ per cent debentures were 104½.

Borax Consolidated were again steady at 54s. 6d., British Aluminium were firm at 42s. 9d., British Oxygen higher at 96s., and Turner and Newall strengthened further to 81s. on market talk of higher dividend possibilities. United Molasses at 44s. 6d. were firm and the 4s. units of the Distillers Co. have been well maintained at 19s. following the news of the placing of the private loan. Iron and steel shares were generally well maintained, and elsewhere, Staveley moved slightly higher at 80s. 6d. Triplex Glass remained active, but at 26s. 3d. lost part of their recent sharp advance. United Glass Bottle kept firm at 75s. Boots Drug were good at 49s. 3d. Associated Cement strengthened to 88s. 9d., and in paint shares, Lewis Berger 4s. units rose to 29s. 6d. in anticipation of higher dividend. British Xylonite at 80s. were higher on balance. British Glues and Chemicals 4s. units have been well maintained at 24s. 9d., but British Match eased to 33s. 9d. Lever and Unilever at 40s. 6d. were steady on market hopes that if a big new issue of capital is planned, shareholders may be offered preferential terms of allotment. In oils sharp gains were recorded by Lobitos, Ultramar and Mexican Eagle.

Market Reports

THERE has been no apparent easing of the demand for industrial chemicals during the past week, and quotations continue to display a firm undertone. A further advance in the price of lead has brought the new basis price for dry white lead to £153 10s. per ton and for dry red lead £146 per ton. The price of copper has also been increased and copper sulphate is now quoted at £56 10s. per ton. Quotations for tartaric acid have risen by 10s. per cwt. A continued steady demand is reported for most of the soda products and the potash chemicals remain firm. Other items finding a ready outlet include the barium compounds, hydrogen peroxide, formaldehyde and bleaching powder. The general supply position remains good and the volume of shipping business in a wide range of materials is keeping up fairly well. The recent improvement in the demand for creosote oil and cresylic acid has been maintained.

MANCHESTER.—Satisfactory trading conditions have been reported in most sections of the Manchester chemical market during the past week. Inquiries from home users as well as for export account have been fairly numerous and new business has been coming forward steadily. There is, in addition, a regular flow of delivery specifications, especially for the alkali products and the potash compounds. Price changes during the week, all of which were increases, have affected chiefly the non-

(continued at foot of page 412)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH VITAMIN PRODUCTS (HOLDINGS), LTD., London, E.C. (M., 16/9/50). Aug. 15, £50,000 deb. stock (with power to create further stock up to an aggregate of £100,000) secured by a trust deed dated Aug. 9, 1950; charged on specified shares; and a general charge.

BRITISH VITAMIN PRODUCTS, LTD., London, E.C. (M., 16/9/50). Aug. 15, charge securing deb. stock of British Vitamin Products (Holdings) Ltd., amounting to £50,000 and secured by a trust deed dated Aug. 9, 1950; charged on land and buildings at Broomfield Road, and Victoria Road, Chelmsford, with fixed plant, machinery, etc.; and a general charge (subject to etc.). *£38,000. Jan. 6, 1950.

DEXTRAN, LTD., Darlington, manufacturers of plasma substitute. (M., 16/9/50). Aug. 8, £18,500 "A" debs. and £6500 "B" debs.; general charges.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 16/9/50). Aug. 14, £500 debs. part of a series already registered. *Nil. July 22, 1949.

MERSEY ELECTRO-PLATING CO., LTD., Liverpool. (M., 16/9/50). Aug. 8, £1250, deb., to F. A. Whitby, Liverpool; general charge.

POWYS PAINTS, LTD. (formerly KIRBY PAINT MANUFACTURING CO., LTD.), Wrexham. (M., 16/9/50). Aug. 12, by order on terms, £1500 second deb., to G. Lomax, Rainhill; general charge. *£1823. Feb. 11, 1950.

Satisfactions

ELTHAM PAINT & VARNISH CO., LTD. (M.S., 16/9/50). Satisfaction Aug. 14, of charge registered May 21, 1947.

ESKETT LIMESTONE QUARRIES, LTD., Frizington. (M.S., 16/9/50). Satisfaction Aug. 14, of debs. registered Jan. 17, 1947, to the extent of £1000.

SOZOL (1924), LTD., London, E.C., manufacturers of chemical preparations. (M.S., 16/9/50). Satisfaction Aug. 10, of mortgage registered November 8, 1946.

Release of Receiver

T. PILKINGTON & CO., LTD., chemical manufacturers, etc., Manchester. (R.R., 16/9/50). Mr. C. H. Mellor, 337/9 Corn Exchange Buildings, Manchester 4, ceased to act as receiver on August 24, 1950.

Increase of Capital

The capital of BALDWIN CHEMICAL SALES, LTD., Harlow, Essex, has been increased by £6000 beyond the registered capital of £1000.

The capital of the CHESEBROUGH MANUFACTURING CO., LTD., has been increased from £100,000 to £200,000.

Changes of Name

The name B. & R. (Disinfectants), Ltd., has been changed to BYERS, RILEY & CO., LTD.

The name of Kerol, Ltd., has been changed to PRESSURE AEROSOLS FILLING CO., LTD.

Company News

Aspro, Ltd.

Gross trading profits for the year ended March 31 were announced at the 15th annual general meeting of Aspro, Ltd., to be £780,376, compared with £432,457 for the nine months to March 31, 1949, and £585,506 for the year ended June 30, 1948. A final dividend of 20 per cent on the ordinary stock was declared, making 35 per cent for the year.

THE STOCK AND CHEMICAL MARKETS

(continued from page 411)

ferrous metal products. Moderate buying interest has been reported in the fertiliser section. Most of the tar products are finding a steady outlet.

GLASGOW.—Business in the Scottish heavy chemical market has been steady and orders are for fairly large quantities. Export trading is becoming more difficult owing to greater demands for the home market and to some extent the influence upon buyers of the international situation.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method and apparatus for the manufacture of massive glass.—Sklarny A. Rafinerie Drive J. Riedel, Narodni Podnik. Aug 13 1948. 644,259.

Production of crystalline unsaturated alkyd resins and copolymerisable compositions and amorphous resins therefrom.—American Cyanamid Co. Oct. 29 1945. 644,287.

Laminated composite materials for lining walls and like purposes.—Jicwood, Ltd., B. Polovtseff, and C. H. Cook. June 25 1947. 644,563.

Normally tacky and pressure-sensitive eucohesive adhesive, and method of preparing the same, and the adhesive tape employing the adhesive. — Minnesota Mining & Manufacturing Co. July 5 1946. 644,291.

Apparatus for delivering predetermined volumes of liquid.—M. A. Lipkau. Aug. 22 1946. 644,569.

Continuous production of soap.—Oreal Soc. Anon. Oct. 21 1946. 644,358.

Stabilised organic liquids of lubricating viscosity and allied substances.—California Research Corporation. Oct. 22 1946. 644,359.

Method of cracking hydrocarbons.—Hercules Powder Co. Nov. 19 1946. 644,299.

Method for industrially obtaining metallic manganese or pure manganese dioxide. —D. Jayet. Dec. 30 1946. 644,580.

Manufacture of alkali metal chlorites starting from chlorine dioxide.—Solvay & Cie. Jan. 7 1947. 644,309.

Process and apparatus for preparing metal articles for a coating operation.—Soc. De Traitements, Applications Et Recherches Thermiques. Jan. 8 1947. 644,581.

Process of preparing an antibiotic substance.—Merck & Co., Inc. Jan. 15 1947. 644,582.

Heat-exchange device for treating oil, cream, fat emulsions, and other viscous substances.—A. V. Hammer. Jan. 15 1947. 644,312.

Coating of articles electrophoretically.—Sylvania Electric Products, Inc. Feb. 14 1947. 644,368.

Radioactive metal products and method of making the same.—United States Radium Corporation. March 15 1947. 644,585.

Recovery of nitrogen dioxide and the production thereof.—Wisconsin Alumni Research Foundation. March 21 1947. 644,371.

Process for the manufacture of melamine and the melamine resulting from said process.—A. H. Stevens. (Monsanto Chemical Co.). April 1 1947. 644,374.

Electric storage batteries.—Lat Manufacturing Co., Ltd., and G. V. Lateulere. June 12 1948. 644,380.

Electrolytic production of chlorates.—Pennsylvania Salt Manufacturing Co. May 20 1947. 644,318.

Fractionation of the components of a mixture in solution.—S. M. Partridge, R. G. Westall, and J. R. Bendall. May 31 1948. 644,382.

Manufacture of inorganic hydrous oxide gels, such as silica gels, in microspheroidal form.—American Cyanamid Co. July 4 1947. 644,322.

Textile-printing compositions.—Interchemical Corporation. July 16 1947. 644,390.

Filtering apparatus for fluids.—R. Poole. Nov. 16 1948. 644,391.

Welded joints.—Koehring Co. July 17 1947. 644,393.

Lubricating greases containing lead soaps.—N.V. De Bataafsche Petroleum Maatschappij. July 29 1947. 644,395.

Mixed esters.—Bakelite Corporation. July 29 1947. 644,597.

Non-austenitic steel.—Salle Steel Co. July 30 1947. 644,598.

Ferrous alloy.—Coast Metals, Inc. July 31 1947. 644,325.

Fluorescent material.—Sylvania Electric Products, Inc. Aug. 6 1947. 644,599.

Manufacture of oxazolidine-2, 4-dione therapeutic products.—Abbott Laboratories. Aug. 8 1947. 644,422.

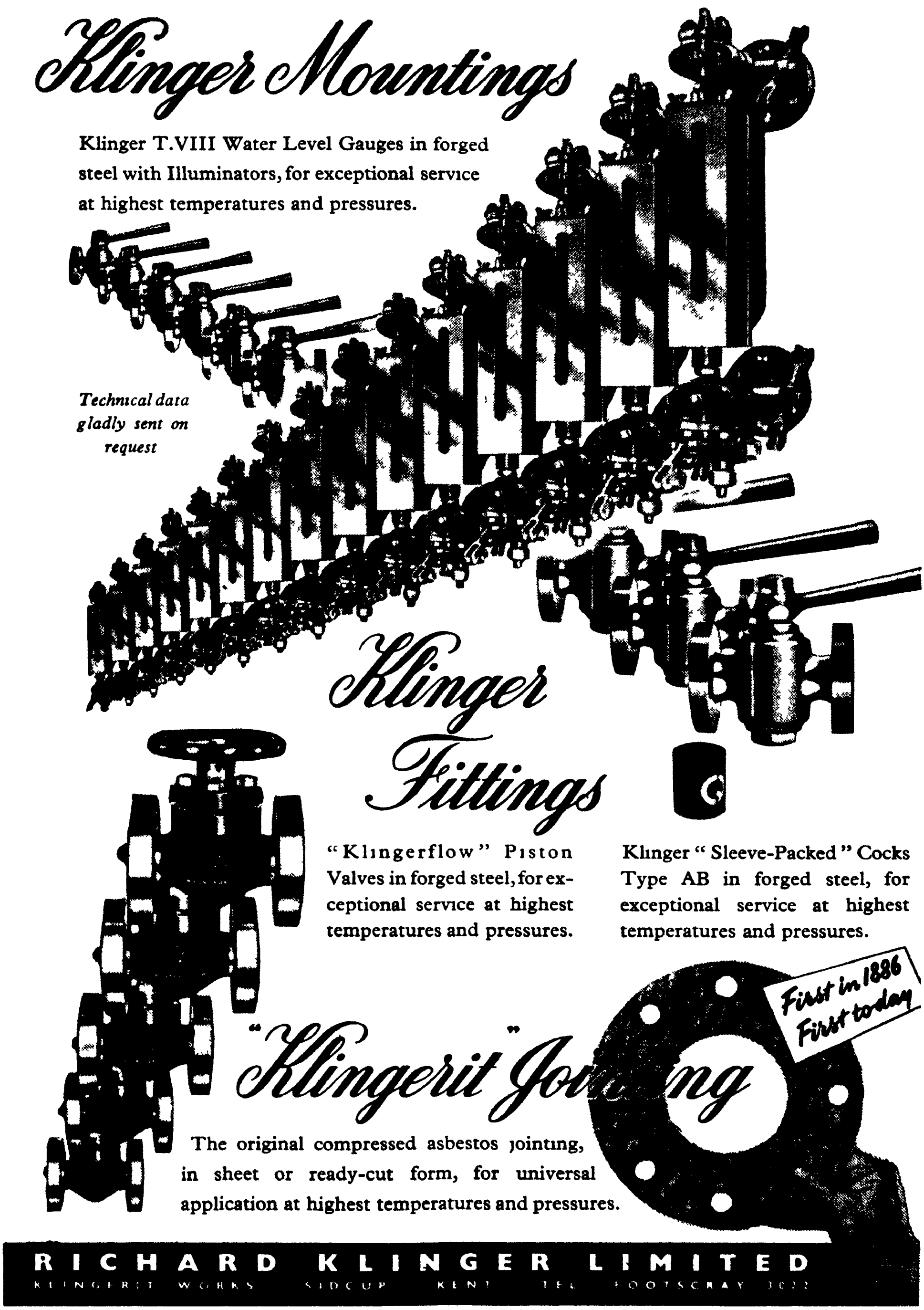
Alloys.—R. D. Wassermann. Aug. 12 1947. 644,601.

Electron-ray tubes adapted for photographing electron images.—N.V. Philips' Gloeilampenfabrieken. Aug. 27 1947. 644,604.

Treatment of polythene.—E. I. Du Pont de Nemours & Co. Aug. 28 1947. 644,429.

Method of manufacturing calcium carbonate.—Ecusta Paper Corporation. Aug. 29 1947. 644,430.

Process for preparation of α-phenylacetamido-β, β-diethoxy-propionic acid.—Merck & Co., Inc. Oct. 18 1947. 644,439.



Production of tertiary rosin alcohols.—Ridbo Laboratories, Inc. Oct. 15 1947. 644,399.

Production of useful articles from coal.—C.D. Patents, Ltd., J. G. Bennett, C. D. Greaves, and W. D. Parker. Sept. 28 1948. 644,329.

Methods of curing cement-type cold moulding compositions.—British Thomson-Houston Co. Nov. 3 1947. 644,615.

Moulding and laminating compositions.—British Industrial Plastics, Ltd. Nov. 11 1947. 644,450.

Process for the condensation of sulphonic acids.—L. Bolgar. Nov. 19 1947. 644,451.

Method of and apparatus for removing volatile solvents from materials which have been treated therewith.—Prvni Brnenksa A Kralovopolska Strojirna, Gottwaldovy Zavody, Narodni Podnik. Nov. 19 1947. 644,452.

Separation of tantalum and niobium.—Soc. Generale Metallurgique De Hoboken, and F. Cuvelliez. Nov. 21 1947. 644,454.

Preparation of organic phosphates.—American Cyanamid Co. Nov. 26 1947. 644,616.

Method of polymerisation.—Phillips Petroleum Co. Dec. 16 1947. 644,620.

Short path fractionating centrifugal stills.—Metropolitan-Vickers Electrical Co., Ltd., and G. Burrows. Dec. 14 1948. 644,621.

Apparatus for preparing a solution of blood of known blood count.—J. Kielland. Dec. 20 1947. 644,460.

Electrostatic shields for *p*H electrodes.—G. Kent, Ltd. Dec. 22 1947. 644,333.

Tubular electrodes.—Soc. Anon. Vetreria Italiana Balzaretti Modigliani. Dec. 30 1947. 644,463.

Process for case-hardening metals and their alloys.—F. J. Sowa. Dec. 31 1947. 644,465.

Ceramic insulators.—Philips Electrical, Ltd. Dec. 31 1947. 644,626.

Preparation of derivatives of phosphorous oxychloride.—I.C.I., Ltd., H. Zenftman, and A. McLean. Sept. 13 1948. 644,467.

Production of resinous polyesters.—I.C.I., Ltd., and A. McLean. Sept. 13 1948. 644,468.

Surface hardening of steel articles.—Elektriska Svetsnings-A/B. Jan. 6 1948. 644,470.

Process for manufacturing synthetic mullite.—Pilkington Bros., Ltd., and C. Jones. Jan. 4 1949. 644,471.

Production of glutamic acid.—International Minerals & Chemical Corporation. Jan. 8 1948. 644,628.

Production of diazotype photo-printing materials.—Hall, Harding, Ltd., and W. P. Leuch. Dec. 22 1948. 644,493.

Dehydration of hydroxylated fatty acid esters.—L. Berger & Sons, Ltd. Jan. 14 1948. 644,406.

Abrasive articles.—Carborundum Co. Feb. 3 1948. 644,337.

Method of and apparatus for abrasive polishing.—Doehler-Jarvis Corporation. Feb. 17 1948. 644,476.

Ionisation pressure gauge.—Department of Commerce, Director of the Office of Technical Services of. Feb. 27 1948. 644,479.

Flexible tubular structures made of thermoplastic material.—Dunlop Rubber Co., Ltd., and J. Hinton-Jones. April 21 1949. 644,516.

Manufacture of boron carbides.—F. Sivarovski. May 14 1948. 644,525.

Manufacture of steroid-17-carboxylic acids.—Ciba, Ltd. May 14 1948. 644,526.

Production of non-volatile organosilicic oils.—Soc. Des Usines Chimiques Rhone-Poulenc. May 25 1948. 644,528.

Process for vaporising sulphur for producing sulphur derivatives.—Standard Oil Development Co. June 30 1948. 644,537.

Dusting powder for plant seeds.—H. Kaserer. Aug. 9 1948. 644,543.

Electric storage batteries.—Lat Manufacturing Co., Ltd., and G. V. Lateulere. June 12 1948. 644,420.

Electrolytic capacitors.—Telegraph Condenser Co., Ltd., P. A. Sporing, and N. H. Bentley. July 26 1949. 644,560.

Production by photographic colour development of images of benzopyrazines and of benzopyrazines having fused to the pyrazine ring a benzene, naphthalene or quinoline ring system.—General Aniline & Film Corporation. Dec. 11 1946. 644,863.

Aluminium base alloy.—T. F. Bradbury. Jan. 21 1948. 644,776.

Preparation or maintenance of a liquid having a desired chemical characteristic.—Wallace & Tiernan Products, Inc. Feb. 21, 1947. 644,777.

Production of finely divided metal compounds.—F. Watson. (Hoganas-Billesholms Aktiebolag). March 14, 1947. 644,781.

Process for removing coating compositions from substrata coated therewith, and the manufacture of preparations therefor.—Ciba, Ltd. April 8 1947. 644,791.

Synthetic folic acid and related compounds and the preparation thereof.—American Cyanamid Co. April 28 1947. 644,913.

Process of chlorinating acetaldehyde.—F. C. Potts (Shawinigan Chemicals, Ltd.). May 31 1947. 644,914.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Dogmatic Stand on Steel

BY its decision to press on with the nationalisation of the iron and steel industry, regardless of the warnings and the opposition of practically every responsible spokesman on the other side, the Government has permanently dissipated the recent hope that it is capable of deferring at critical moments in the country's affairs the pursuit of purely doctrinaire objectives. To this fact alone must be attributed the abrupt substitution in Parliament during the past seven days of violent political dissention, in the place of the growing readiness to find common ground wherever compromise made it possible to present a united front to hostility without. The political scene since the Minister of Supply announced the impending appointments (to be effective on October 2) of the chairman, Mr. S. J. L. Hardie, chairman of the British Oxygen Company, and the deputy chairman and five full or part-time members of the Iron and Steel Corporation of Great Britain has confirmed what was wholly apparent to all in Parliament and nearly everyone else—that there is no common ground here on which to reach any kind of amicable arrangement, much less to gain the willing collaboration which would be needed to ensure that the iron and steel industry is not crippled by an ill-timed and needless experiment.

Had the Government's decision been taken at a happier juncture in world affairs it would still have merited most of the censure it is receiving now, as being a frivolous rebuff to the desire to see the country united in the common drive for economic improvement. The recent evidence that our need for arms—in which full supplies of steel are a primary essential—has acquired a new acute urgency made inexcusable the announcement on September 14 that there is to be no respite of the plan to "scramble" most of the sources of growing steel supplies in honour of a Socialist formula.

For those who distrust their own qualifications to judge the evidence for or against what is now proposed an authoritative verdict is to be seen in the absence from the proposed steel authority of those who have directed the iron and steel industries, whose leadership has produced in little more than four years a post-war growth which none of the nationalised industries seems able to approach. The reasons why the steel experts are taking no part in the plan to re-shape their own industry was made plain last week-end by Sir Ellis Hunter, president of the British Iron and Steel Federation. The steelmakers' president said this:

The federation has never deviated from

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

its united opposition to the nationalisation of iron and steel, because of its conviction that it would be highly damaging both to the steel industry's efficiency and to the public interest. It has consistently represented to the Government that if their purpose is to ensure that the policies of the industry conform with national needs, then this objective can be better attained through a statutory board exercising supervisory functions, on the lines of the Iron and Steel Board which operated from 1946 to 1949.

The leader of the steelmakers' group has most appropriately recalled the statement in which the Minister explained his reasons, last November, for taking no action then to set in motion the State steel plan. On the eve of a General Election, the political chiefs thought it "plainly unwise in an atmosphere of political tension and uncertainty to proceed with the selection of individuals to serve on the corporation." Now the Government has revived a condition of political insecurity as widespread as in the autumn and, what is worse, has failed to satisfy one of the essential conditions for nationalising a highly specialised industry.

In November, Mr. Strauss stated as an axiom that the success of the nationalised industry "will depend to a considerable extent on the calibre of the men serving on the corporation, and that it would be folly to rush our selection of these people unnecessarily." While there is no evidence showing—or disproving—that the present appointments were "rushed," they will certainly be seen as makeshifts by those who are acquainted with the drive, reinforced by deep knowledge of steel processes and steel needs, possessed by many of today's steel men. It constitutes no criticism of the first chairman's proved ability in his own vital section of modern industry, or of the various capabilities of the others named, to assert that if such a body is indeed required there are others much better fitted to compose it. There are some grounds for thinking that Mr. S. J. L. Hardie himself would not reject that proposition. His statement last week that he had accepted "with some reluctance" the Government's invitation to make break with his life-long industrial sphere, but had been persuaded by the overriding importance of the steel industry, seems to place the whole project on the level of a national misfortune, whose worst results some public spirited individuals will make personal sacrifices to avert. One, Mr. R. A. Maclean, a part-time member, has already decided that the cause does not warrant the stifling of his convictions—and withdrawn.

Notes and Comments

Capital Problems

RAISING capital to maintain chemical industries and permit only essential modifications required for healthy competitiveness is not the simple process which the ready response to some recent public issues would seem to have indicated. That is now stated to be the reason why I.C.I., Ltd., elected to secure its very much larger capital needs, represented by the recent issue of £20 million medium-term loan stock, from the insurance companies, rather than from present stockholders or the general public. I.C.I.'s reasons for by-passing the traditional source of capital, which occasioned at the time hard feelings among some private investors and the stock market, have been set out by the group's finance director, Mr. S. P. Chambers, in *The Financial Times* (September 16), and in general supply expert confirmation of the current view that private savings, diminished by taxation and other inflated charges, are incapable of absorbing issues of this size without serious disturbance of the values of existing investments. Most of the evidence offered in support for this diversion from the usual channels, which is represented as being only a temporary expedient, is shown to stem from the current policy in regard to taxation. In the view of I.C.I.'s finance authority, the supply of equity capital has been severely discouraged by high taxation of the return on ordinary shares, which the alternative of a preference issue would only serve to heighten. The same factor has diverted a large proportion of investment to the life assurance companies, which are represented now as the collective dispensers of what remains of private savings. Fortunately, in view of the serious objections to the concentration of capital interests of such fundamental industries as I.C.I.'s, the recourse to the insurance companies is not seen as a permanent solution. "It is no substitute for equity capital, which must always form the main element of all permanent capital," affirms Mr. Chambers.

New Facts about Gases

THE increasing size of the contribution being made by U.S. workers in some fundamental departments of science has received evidence chiefly in what has been done in making known "unnatural" behaviour of gases, of which the remarkable propensities of helium at extremely low temperature have now been followed, at Yale University, by some equally remarkable observations about gases at 50,000 p.s.i. Russian workers are accredited with having recorded, about eight years ago, some of the abnormal conditions which Professor Barnett F. Dodge and A. E. Lindroos have now investigated. The Yale report says, however, that while the U.S. data were "qualitatively similar" they had also uncovered other facts which were quantitatively quite different. The arresting aspect of the American study, the fact that two gases which mix intimately in normal conditions will separate into two distinct layers at 50,000 p.s.i., is not entirely a new discovery. What will perhaps arouse even more interest are the American observations of "barotropic phenomena." The high pressure laboratory has recorded instances of the light gas changing position with the heavier gas when extreme pressure is applied.

Interdependence of Research

THE arbitrary sub-division of chemistry into organic and inorganic and other sections, though convenient, sometimes leads to a peculiarly limited mode of thought when applied too rigorously. An example of this is afforded by crystal chemistry which offers a suitably easy method for explaining the inter-atomic structure of the molecule. In the past it was the organic chemist who concerned him-

self with spatial arrangement rather than his inorganic colleague. Latterly it has been realised that the structure of the molecule is of vital importance in the explanation of certain phenomena such as semi-conductors and piezo-electric effects. Consequently there is now an increasing interest in the architecture of the molecule because of the great possibilities inherent in the practical applications of these things in the development of new scientific tools and equipment. Not least of these is the ability of the crystal of pure germanium to act as a rectifier; it is possible that it will replace the thermionic valve as an amplifier in some circuits. The uncertainty as to the cause of this property of germanium, which is known to be considerably affected by imperfections in the crystal lattice—among other things—helps to underline the fact that chemistry, though subdivided, still remains an entity, of which each section has much to learn from the others.

Smoke and Public Health

ALTHOUGH some optimistic proposals to set up smokeless zones in towns with legal sanctions to enforce them have experienced some setbacks there is no abatement of vigour in the renewed attack on the practices which load the air with smoke and products very much more pernicious. The National Smoke Abatement Society intends, at its annual conference at Margate next week, to establish the responsibility of industrial fogs for much more serious results than partial blackouts and general discomfort. It has forceful allies in the medical profession, some of whom at Margate will testify to the lethal possibilities, of which there is no lack of circumstantial evidence. Dr. J. S. G. Burnett, Preston's MOH, has prepared an incriminating dossier based on recorded rises in localities' death rates during periods of smoke fogs, supported by additional evidence from Belgium and the U.S.A., where the death roll of at least 20 during four days of "smog" in Donora provided tragic proof of what sulphur dioxide and acid laden carbon particles can do. Those are a small part of the very dangerous substances to which some chemical and metal industries may give rise. One, benzpyrene, is to be discussed at Margate by a specialist from St. Bartholomew's Hospital, Mr. R. E. Waller, who will show there is at least a *prima facie* case for attributing to it some of the incidence of cancer of the lung. Even if this cannot be fully substantiated there is little, except the comparatively high cost of filtration and monitoring equipment, with which to answer the case for arresting most of the gases and solids which pass through the smoke stack. A few are nearly as valuable as germanium.

Scottish Chemists Demand—and Get—a Hearing

PERSISTENT refusal of the Secretary of State for Scotland (Mr. Hector McNeil) to meet them in person was alleged in a statement issued last week by the Pharmaceutical General Council (Scotland) regarding the proposed withdrawal of a number of Scottish chemists from the National Health Service.

The council emphasised that the chemists have all along been willing, and indeed anxious, to have arbitration proceedings continued immediately.

"What the chemists strenuously object to," the statement continued, "is that before the Secretary of State enters into arbitration proceedings, he arrogates to himself the right to impose a cut, of the justice or injustice of which he cannot be aware without investigation which neither he nor his staff have undertaken."

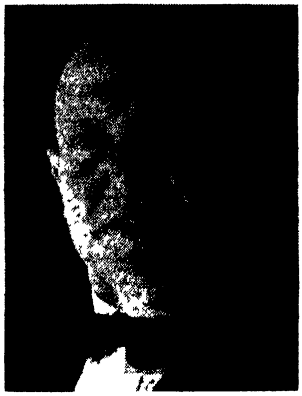
In the House of Commons last Monday, in a written answer, Mr. Hector McNeil reiterated his arguments in defence of the eight per cent reduction in payments and stated that he proposed to invite the chemists' representatives to meet him in the near future.

Chemicals at Grangemouth

A further stage in the extension of chemical production at Grangemouth is foreshadowed by the granting by the Dean of Guild Court there of permission for a £84,000 extension to the I.C.I. plant. The new factor will be used for the production of organic chemicals and dyestuffs.

STEEL CORPORATION APPOINTMENTS

Experts Omitted : One Member Withdraws



The first chairman

THE culmination of strong controversy which for nearly two years has surrounded the Government proposal to nationalise most of the productive capacity of the iron and steel industry and many associated fabricating interests was reached in the House of Commons on September 14. The Minister of Supply (Mr. George Strauss) announced the appointment of the chairman, deputy chairman, three full-time members and two part-time members of the Iron and Steel Corporation of Great Britain.

The securities of the companies named in the third schedule to the Act, said the Minister, would vest in the corporation on January 1, 1951, or as soon as practicable thereafter. When the corporation was set up he proposed to consult its members about the earliest convenient date, and would make a further announcement.

On Tuesday this week an Opposition motion of censure, after six and a half hours' debate, was defeated by six votes.

First Officials

The first members of the corporation were announced to be these:

MR. S. J. L. HARDIE, chairman of the British Oxygen Co., Ltd., vice-chairman of Metal Industries, Ltd., and chairman or director of several other industrial firms.

Deputy chairman: SIR JOHN GREEN, director of Thomas Firth and John Brown, Ltd., and chairman of the central conference of the Engineering and Allied Employers' National Federation.

Full-time members: SIR VAUGHAN BERRY, British delegate to the International Authority for the Ruhr; GENERAL SIR JAMES STEELE, Adjutant-General to the Forces; MR. W. H. STOKES, of the Amalgamated Engineering Union and chairman, Midland Regional Board for Industry.

Part-time members: MR. J. W. GARTON, chairman of Brown Bayley's Steel Works, Ltd., and managing director of the Hoffmann Manufacturing Co., Ltd.; MR. R. A. MACLEAN, chairman of A. F. Stoddard and Co., Ltd., director of Scottish Industrial Estates and other commercial concerns.

Their salaries will be: chairman, £7500; full-time members, £5000; part-time members, £500.

One Withdraws

Four days later (September 18) Mr. R. A. Maclean withdrew his acceptance of a seat on the corporation. He wrote then, in a letter to the Minister: "I am an industrialist, not a politician, and the intense political controversy surrounding the setting up of the corporation has created at atmosphere in which I could not usefully or happily serve. . . . Anyone accepting an appointment to the corporation ought to be prepared to identify himself with and support the policy of iron and steel nationalisation. This is an undertaking I was not asked to give and one I am not willing to accept."

The difficulty which the Government has experienced in finding suitable officers has been underlined by the conspicuous omission of foremost individuals in the iron and steel producing industries. A statement by the president of the British Iron and Steel Federation, following the Cabinet decision, amplified the anomalous situation. Sir Ellis Hunter disclosed that the federation had informed the Minister of Supply that it could not accede to his request to suggest the names of persons who might serve on the corporation.

"It has consistently represented to the Government that if its purpose is to ensure that the policies of the industry conform with national needs, then this objective can be better attained through a statutory Board exercising supervisory functions, on the lines of the Iron and Steel Board which operated from 1946 to 1949," he wrote.

Even more remarkable has been the absence from the corporation of trade union leaders associated with iron and steel production.

SMOKE ABATEMENT

Society's Twenty-first Conference

HEALTH and the better burning of fuel will be the main themes for the 400 members and delegates who will be meeting at Margate on September 27 for the 21st annual conference of the National Smoke Abatement Society, which continues until September 29. This will be marked by the presentation of the first Des Voeux memorial lecture, read in honour of the society's first president, Dr. H. A. Des Voeux, who helped to found one of its two parent bodies in 1899.

These lectures will be of more than usual significance and scope, and are intended to relate smoke abatement to subjects of wider national interest. The first is to be by Dr. D. T. A. Townend, formerly professor of fuel technology at Leeds University and now director-general of the British Coal Utilisation Research Association. His paper, "Towards the Better Use of Coal," will be scientifically important and topical.

Medical Evidence

Two papers on the relation of smoke to respiratory disease will be read, one by Dr. J. S. G. Burnett, medical officer of health for Preston, and the other by Mr. R. E. Waller, of the department of pathology, St. Bartholomew's Hospital. Dr. Burnett will discuss the increased mortality during smoke fogs, both in this country and in the disastrous cases that have occurred in Belgium and the United States. Mr. Waller is to give an account of experimental work in progress relating to the frequency of cancer of the lung in towns as compared with country areas, and to the presence in town air of a cancer-producing substance, benzpyrene, of which the domestic coal fire is the likely source.

At another session the question of preventing smoke in new housing, by using modern methods and smokeless fuels, will be discussed in a series of short papers, including one on the new towns and one on the first plans for including housing areas in smokeless zones, where all smoke will be prohibited. Finally, the widespread problem of railway smoke will be surveyed in two papers, in one of which an officer of British Railways will describe how they are attacking it.

A novelty is being provided by British Railways which has arranged that one of their instructional trains will be at Margate station, in which delegates will see working parts of locomotives and films.

NEW I.C.I. STOCK HOLDERS

£7.5 m from Prudential Group

HOLDERS of the £20 million 4 per cent unsecured loan stock recently placed privately by Imperial Chemical Industries, Ltd. (THE CHEMICAL AGE, 63, 351), were published this week.

The quotation was taken up by 88 different insurance companies and other institutions, of which the Prudential Assurance Co., Ltd., is the largest individual holder with £7.25 million. A further £250,000 stands in the names of Prudential nominees.

Next largest holder is the Sun Life Assurance Company of Canada (£1.5 million) followed by the Legal and General Assurance Society, Ltd. (£1.25 million), with the Pearl Assurance Co., Ltd., and the Refuge Assurance Co., Ltd., each subscribing £1 million.

Glaxo Enterprise in Canada

PROMOTION on a considerably larger scale of sales in Canada of Glaxo Laboratories, Ltd., is the object of the formation, announced this week, of a new subsidiary, Glaxo (Canada), Ltd. It will have its head office at Saxony Building, Duncan Street, Toronto. Mr. Joseph Hutchinson has been appointed managing director and has been accompanied to Canada by Mr. L. A. Gullick, who has been appointed a director. Mr. Hutchinson, formerly home sales director at the company's Greenford division, previously spent 10 years in Canada for Glaxo Laboratories, Ltd. Mr. L. A. Gullick was formerly in the home sales department and more recently manager of the Glaxo plant at Barnard Castle.

Gap in Coal Stocks

THE failure of the National Coal Board to raise coal production to match current needs was recognised in an answer in the House of Commons by Mr. Alfred Robens, Parliamentary Secrtary to the Ministry of Fuel and Power. He said it had been decided a few days earlier by the emergency committee of the National Productivity Advisory Council that industrial stocks should be built up to a level of about four and a half weeks' supply—a good safety margin—by mid-December.

Industrialists would be required during that period to take coal offered them; it would be of no use for them to refuse deliveries from pits other than those by which they were usually supplied. They would not be required to accept different qualities.

GAS INDUSTRY RESEARCH

Prominent Chemists Appointed

Sir Robert Robinson, O.M.

Sir Cyril Hinshelwood

THE Gas Council has set up a research committee consisting of Sir Edgar Sylvester, chairman of the Gas Council, and, as men of science not engaged in the gas industry, Sir Robert Robinson, O.M., and Sir Cyril Hinshelwood; Mr. E. Crowther, Dr. R. S. Edwards and Mr. W. K. Hutchinson, members of the Gas Council; Mr. F. M. Birks, president of the Institution of Gas Engineers, and Professor A. L. Roberts, Livesey Professor at Leeds University.

The laboratories of the North Thames Gas Board have been recognised as the nucleus of a London research station, and Dr. H. Hollings, who for some years has been controller of those laboratories, has joined the committee as director-designate of the station.

Sir Robert Robinson, who was awarded the Order of Merit in 1949, is a graduate of Manchester University. A Longstaff medallist and Davy medallist, his research in organic chemistry covers a wide field, including studies in the alkaloids and the phenanthrene derivatives. He was appointed professor of organic chemistry at Sydney in 1912 and Heath Harrison professor of organic chemistry at Liverpool in 1951. He became director of research of the British Dyestuffs Corporation Ltd., in 1920. Sir Robert Robinson's other distinctions, in chronological order, include the professorship of chemistry at St. Andrews (1921), the professorship of organic chemistry at Manchester (1922), University College, London (1928), and Waynflete professorship of chemistry, Oxford (1930); Paracelcus medallist, Swiss Chemical Society (1939). He was president of the Chemical Society (1939-41) and was elected president of the Royal Society in 1945. He was knighted in 1939 and awarded the Nobel prize for chemistry for 1947. He is a past vice-president of the Union Internationale de Chimie.

Sir Cyril N. Hinshelwood is distinguished for his work on the kinetics of reactions chemical and bacteriological. He is a graduate of Balliol College, Oxford, and was lecturer in chemical dynamics at Oxford from 1927 to 1937, when he became Dr. Lee's professor of chemistry at the same university. His other appointments and awards include the Lavoisier medal of the Société Chimique de France (1935): the Davy medal of the Royal Society (1943) and the Royal medal (1947); Longstaff medal of the Chemical Society (1948). Professor Hinshelwood was president of the Chemical Society from 1946-1948.

Strike Cuts Gas Supplies

DISSATISFACTION with the award of a wage increase of $1\frac{1}{2}$d. per hour was given as the reason for a strike last week-end by some 600 maintenance engineers at a number of gas works of the North Thames Gas Board. The number on strike was increased on Monday by about 400 employed at other gas works of the North Thames group. Gas supply was reported in some areas on Monday to be running low and by mid-week widespread gas cuts in several localities in S.E. England had occurred. By then 17 gas works and a by-products plant were affected and some two million consumers were receiving reduced gas supplies.

COSTLY PETROCHEMICAL EQUIPMENT

Why Operating Company Needs Another £2.5 M.

THE need to increase the company's borrowing powers to permit negotiations for additional capital up to £2.5 million was explained by Sir Robert Renwick in his speech, as chairman, at the extraordinary general meeting of Petrochemicals, Ltd., in London on September 18. The need for the increased capital was occasioned largely by the heavy cost of plant construction delays. The company's programme for construction at Partington had, he said, fallen sadly by the wayside, and his most optimistic forecast now was that full operation would be achieved by the spring of 1951.

Exacting Separations

On the liquid side, the various constituents of the crackylate—the aromatic product of the Catarole furnaces—had to be separated and purified. Any bottleneck in the individual operations could prevent a whole subsequent series of operations taking place. There had also been serious delays in bringing this group of plants into commercial production and, to achieve the maximum purity of the individual products and the minimum waste, they had to work to very close specifications.

A serious delay had occurred in the gas separation plant, which was essential to over 50 per cent in value of the company's ultimate production. This plant was of special design, and therefore was full of teething troubles and problems. The accumulation of delays in bringing the plants into full commercial production was one of the prime causes of the very heavy running-in losses.

Since 1949 the situation had been further aggravated by the increased charges for interest and depreciation due to the delays and the increased construction costs and to the fact that devaluation had raised the cost of the company's charging stock, fuel, and essential chemicals by some £450,000 a year. Additionally, the sale of surplus gas to the gas works would be less than anticipated, for reasons quite outside the company's control.

The net profit envisaged in September, 1949, of £400,000 per annum, after charging interest and depreciation, had been absorbed. It appeared unlikely that there would be any worthwhile surplus, at any rate in the early years.

More than half of the £2.5 million for which he was negotiating would be required to meet the running-in losses incurred or estimated to be incurred before the whole plant was in commercial production, and the continuing overheads on design and construction. Of the remainder, under £1 million would be invested in plant, of which some £850,000 would be necessary to meet the increased cost of the plants now completed or nearing completion. A further £350,000 was required for certain improvements and modifications to the plants. £180,000 represented the company's share of extra capital required for its associated companies, Styrene Co-Polymers, Ltd., and Styrene Products, Ltd., where there had been a similar story of higher construction costs and serious delays.

Summing up, Sir Robert Renwick said once the plant was in full production and had been proved to operate satisfactorily over a continuous period, it was envisaged that opportunities would arise for the erection of further conversion plants for the production of a number of chemicals commanding high prices. For these the additional capital cost was relatively low.

Industrial Alcohol Prospects

REFLECTING, it is thought, heightened activity in most industries, the demand for industrial alcohol and related chemical products had shown a substantial increase during the past year, stated Mr. H. J. Ross, chairman at the annual general meeting (reported fully on pages 444-447) of the Distillers Co., Ltd. The improvement included an expansion in the company's direct chemical export trade.

A year ago there appeared to be a prospect of securing forward supplies of molasses at reasonable prices, and the company was fortunate in covering its requirements for the greater part of the current year. The further outlook, however, was much less favourable, due partly to the poorer Cuban crop last season, coupled with the unforeseen high demands for molasses throughout the world, and particularly from the U.S.A. There appeared to be every likelihood of a substantial rise in the price of molasses, but his company's purchasing arrangements through the United Molasses Co., Ltd., would, it was hoped, safeguard its position as far as was possible in that difficult market.

U.S. SAFEGUARDS SUPPLIES

Restricted Dealing in Chemicals

THE need to enforce restraint in the U.S.A. on over-buying, to which the influence of the current arms programme might give rise, was recognised by the statutory control, as from Monday, of private purchases of over 80 materials which may become scarce. An order of the National Production Authority has rendered it illegal for manufacturers or dealers "to buy, receive, order or deliver more than a practicable minimum working inventory" of a list of basic products, many of which are associated with the chemical process and metal industries.

The same principle animated an earlier order by the U.S. Secretary of Commerce with the purpose of reducing U.S. domestic consumption of new natural and synthetic rubber in the last four months of this year to 90,000 tons, instead of approximately 110,000 tons.

The list of commodities, the excessive buying of which has been prohibited, includes these:—

Industrial alcohol, benzine, caustic soda, chlorine, glycerin, and soda ash; wood pulp: pig iron, grey iron castings, carbon and alloy steel, rough forgings, iron and steel scrap; aluminium, columbium, cobalt, copper and scrap containing copper, magnesium, manganese, nickel, tin, tungsten, zinc, other non-ferrous scrap; rayon yarn, nylon staple, and nylon filament yarn

MOS Discusses Copper Premiums

PROBLEMS of finding an alternative to the present system of premiums on forward purchases of copper are now under discussion with the industry, according to a statement in the House of Commons by Mr. George Strauss, Minister of Supply.

Premiums which were recently heavily increased (THE CHEMICAL AGE, 63, 354) were, sa'd the Minister, imposed to protect the Exchequer from the results of heavy forward buying at a time of uncertainty about future buying prices. It was hoped that the discussions might result in some other more acceptable method.

Burden on Railway Charges

THE Federation of British Industries has sent the Minister of Transport, this week, a reasoned case against the maintenance, at the cost of railway users, of large unused surplus capacity on the railways, preserved for strategic reasons. The FBI argues that this is imposing unfairly on peacetime transport charges a burden which should be borne by the Defence Estimates. Some of the existing railway capacity and facilities, the memorandum suggests, might safely be dispensed with.

ACCIDENT PREVENTION

Frequency Reduced by 67 per cent

SOME successful principles by which large improvements have been made in the incidence and severity of acidents in one U.S. chemical group have recently been summarised. Dr. G. M. Hebbard, vice-president of the Davison Chemical Corporation, which has received two of the principal safety awards of the U.S. National Safety Council, has stated that one of the first essentials is that every accident, trivial or not, should be traced to ascertain its basic causes.

The company during 1949 reduced by 67 per cent the frequency of accidents in its phosphate rock division and halved the rate of severity. Its figures for the year represent only 22 per cent of the average accident frequency in its own industrial group and a severity rate of only 5 per cent. The company is reported to have received a rebate of more than $30,000 from its industrial insurance company.

Dr. Hebbard states that when, having traced an accident to its causes, a hazardous condition was discovered, the company looked for the cause in management procedures first, in the design or operation of equipment second, in the methods of worker training third, and in the thinking and work habits of the workmen last. Safety practices were interwoven with job training and instruction. The management followed up with carefully detailed committee consideration every accident and every hazard. One man was directly responsible for safety practices in each plant, whatever its size.

By use of photographs and of accident report forms the development of safety was turned into the equivalent of an engineering operation.

Tritium in Heavy Water

THE research institute of Temple University, Philadelphia, U.S.A., announced at the end of last week the discovery in heavy water of tritium, the hydrogen bomb explosive. Tritium, as made in atomic reactors, at present costs over £178 million a pound.

The natural tritium was discovered with the spectroscope—in samples of heavy water from England and Norway—by Professor W. F. Libby, of the institute of nuclear studies of the University of Chicago, and Professor A. V. Grosse, of the Temple University research institute. There is at present no way of extracting pure tritium from heavy, or other, water.

TANNIN IN CHEMICAL ANALYSIS

*Accurate Methods for Radioactive Mineral Assays**

THE organic reagents generally used in acid-earth analysis are tannin and cupferron. Cupferron, ammonium-nitroso-β-phenyl-hydroxylamine, reacts in either strongly or weakly acid solution, and the control of the degree of acidity is of the utmost importance. Generally, cupferron precipitates the following elements in strongly acid solution: Ce^{IV}, Nb, Ga, Fe, Ta, Sn, Ti, W, U^{IV}, V, Zr and Hf, using 5 to 10 per cent sulphuric or hydrochloric acid. In weakly acid solution cupferron precipitates Al, Bi, Ce^{III}, Cu, Pb, Hg, Ag, and Th, but these precipitations are not always quantitative.

Disadvantages of Cupferron

Unfortunately, cupferron has several disadvantages when used in chemical analysis. It is very unstable and decomposes in contact with air, and thus cannot be kept for any length of time. In the determination of thorium, cupferron has no advantage over ammonium and is unreliable in the estimations of vanadium. There is nothing to be gained in the use of cupferron when compared with the gravimetric determination of iron or copper. In the cupferron precipitations titanium and vanadium accompany the iron.

Apart from its usefulness in separating aluminium and chromium in the analysis of titanium and zirconia, cupferron is useful as a reagent only when the general composition of the mineral to be analysed is known. It is not a sufficiently selective reagent to effect separations in solutions containing more than a limited number of elements.

For the recovery and separation of the acid earths, tannin is much more satisfactory. In addition to being more stable, tannin is cheaper and more efficient, while the separations are not so laborious.

Tannin, digallic acid ($C_{14}H_{10}O_9$), is soluble in warm water, forming a suspension of negatively charged particles, and its use in analysis is based on its ability to precipitate positively charged sols of metallic hydroxides by means of reciprocal flocculations. Although the precise nature of the reactions is not completely understood, it is possible that the formation of adsorption complexes takes place and that the precipitation is caused by the neutralisation of the colloid charges by the opposite charges of the inorganic ions.

The precipitates are very flocculent but are readily filtered. This is most conveniently done in a slight vacuum, mixing the precipitates with a small quantity of paper pulp. The tannin precipitates must be well washed with solutions of a volatile electrolyte, such as ammonium nitrate or chloride (mixed with a little tannin) which assists in the final calcination of tannin. After calcination of the precipitate, the residual oxides form a soft powder which rapidly attains a constant weight, and which is easily fusible with potassium bisulphate.

Tannin is indispensable in the analysis of tantalum, niobium and titanium. It quantitatively precipitates the acid earths and other metals from tartaric acid solutions, and under specific conditions it quantitatively precipitates tantalum, niobium and titanium from oxalic acid solutions, the other elements present with the earths remaining in solution. The tannin precipitations must be carried out either in neutral solutions or in solutions only slightly acid or alkaline. An excess of mineral acid or ammonia can prevent any precipitation of the tannin complex and for these reasons the *p*H of the solutions must be carefully controlled.

Besides the need for an excess of the flocculating agent, the tannin must be added in hot solution, of between 2 and 5 per cent. depending upon the precipitations. If the solution is boiling flocculation is more complete and the precipitate settles more rapidly. The amount of tannin added must be at least 10 times that of the oxides to be precipitated.

Separation of Titanium

In the analysis of tantalo-niobates, excluding minerals containing radioactive elements and rare earths, the oxides of Fe, Al, Zr, Mn, Be, U and V are all collected together after the removal of the tantalum, niobium, titanium and tungsten. Instead of precipitating iron and manganese with H_2S, the titanium is first separated by precipitation with tannin in oxalic acid solution. The filtrate contains the oxides of Fe, Mn, Al, Zr, etc., and is made alkaline, and the oxides are precipitated with ammonia, after which the iron and manganese are separated.

For minerals containing much titanium

* Abstract from "The Use of Tannin in Chemical Analysis" by L. L. Colin. M.I.M.M.E., M.I.M.M. (London) PhD. in *The Journal of the Chemical, Metallurgical and Mining Society of South Africa*, 53, 12, 314.

this procedure gives more accurate assays for the iron, because the sulphide precipitates generally carry down some titanium.

Tannin will separate uranium from alkaline solution as a brown flocculent precipitate, which can be filtered off very rapidly. In certain conditions tannin quantitatively separates uranium from titanium and this property is the basis of a very rapid and accurate method for the analysis of uranium in radioactive ilmenites. For the qualitative determination of uranium an ultraviolet fluorescent method can be used, although vanadium may interfere when low grade samples are being assayed.

The success of the method used for the analyses of the acid earths and rare earth minerals depends upon the early separation of titanium by tannin precipitation in a solution rendered slightly acid with oxalic acid. Tannin quantitatively precipitates Ta, Nb and Ti from a weakly acid oxalate solution semi-saturated with ammonium chloride. Zirconia, thoria, alumina, beryllia and uranic oxide are not precipitated in these conditions.

An illustration of this separation is given by an analysis of a synthetic sample made up to contain the equivalent of: 0.1250 gm Fe_2O_3; 0.2500 gm TiO_2; 0.0086 gm V_2O_5; 0.0600 gm U_3O_8.

The titania was separated in a weakly acid oxalate solution, semi-saturated with ammonium chloride and the filtrate was made alkaline to precipitate the remaining oxides together. After fusion, the iron was precipitated in an alkaline solution with ammonium carbonate. The filtrate was treated with tannin and the precipitate of vanadium and uranium oxides was calcined and fused. The vanadium was separated from the uranium by precipitation with tannin in a weakly acid solution of acetic acid and ammonium acetate. The recoveries were: 0.1247 gm Fe_2O_3; 0.5030 gm TiO_2; 0.0083 gm V_2O_5; 0.0601 gm U_3O_8. The impurities in the titania and uranium oxide precipitates were found to be iron.

The determination of uranium in complex minerals is best begun by a rapid separation of the rare earths. Thoria and the oxides of cerium, terbium and yttrium form insoluble fluorides, while the other minerals, including Ta, Nb and Ti, are soluble.

The precipitation of the rare earths in the cold with ammonia and a minimum of ammonium chloride is preferable, since the rare earths have a tendency to dissolve when the alkaline solutions are boiled, afterwards depositing as a fine white powder as the filtrate cools.

To precipitate thoria, sebacic acid is better than sodium thiosulphate, which introduces troublesome colloidal sulphur and is also more laborious in use. With sebacic acid, the thoria precipitate collects rapidly and is readily filtered.

Tannin gives a dark blue precipitate with vanadium of extreme sensitivity, effective at one part in ten million. A great advantage of the use of tannin in the final separation of vanadium is that the colour of the solution gives an immediate indication of whether the vanadium is present in appreciable quantities or is entirely absent. The preliminary treatment of the solution with ammonia and ammonium carbonate removes the oxides of Fe, Si, Al, Ti, etc., while the tannin precipitation of the filtrate in a weakly acid solution of acetic acid and ammonium acetate obtains the vanadium free of all other elements. The final volumetric determination with potassium permanganate effectively obviates the danger of silica intrusion.

Research to Improve Road Surfaces

THE Road Research Laboratory of the Department of Scientific and Industrial Research has carried out extensive experiments to develop an effective way of ensuring that freshly laid surface dressings are not spoiled by rain. Stone chips used as surfacing material become damp when stored on the roadside and the moisture causes poor adhesion when the chips are spread on the tarred surfaces.

It was discovered that the water on wet stone is displaced if the stone is treated with creosote containing a "wetting" agent.

A solution of creosote and cetyl pyridinium bromide proved to be completely successful in this respect. The best method of coating the stone is in a large mixer, for instance, at a quarry, but for stone already dumped at the roadside a concrete mixer is more convenient. The surface dressing will then stay on the road no matter how hard or how soon it rains after the dressing has been laid. The solution may also be sprayed on the top of the tar film before the stone chips are applied. This method is not quite so effective as using treated stone.

The treatment adds between a penny and threehalfpence per square yard to the cost of surface dressing. Expenditure on surface dressing each year is between £8 million and £12 million and considerable economy should result from making the process more certain, despite the increased costs.

Synthetic Mica Experiments

Partial Success of U.S. Research Project

MICA, in a form suitable for use in radar and radio equipment, has been produced synthetically in substantial quantities at the Colorado School of Mines, as a result of the four-year research project carried out there. Research has also been carried on, with the use of crucibles, by the U.S. Bureau of Standards, Washington, D.C., and the U.S. Bureau of Mines at Norris, Tenn.

Cakes of mica, weighing up to 500 lb., have been formed at the Colorado School of Mines by a new cool hearth method. The process avoids the use of crucibles and the molten mica is contained in a basin of unmelted raw mixture from which the melt was derived. Crystallisation takes place in this melting basin which forms a centre pool surrounded by a solid cool mass of the unmelted raw mixture.

Elimination of Crucibles

The two largest contributions made by the mines school in the synthetic mica project come in the fields of elimination of crucibles and employment of a travelling hearth, states a report by Dr. Aitkenhead, of the Colorado School of Mines. No crucible material has ever proved completely satisfactory, he says. Platinum, probably the best yet found, is twice as costly as gold and much too expensive for practical use. In addition, the mica cake adheres tenaciously to the platinum, necessitating considerable battering of the crucible to remove it.

Graphite is rapidly deteriorated by oxidation at the high temperatures needed to melt the raw material, and will always contaminate the mica with fine particles. Silica-alumina ceramics are all attacked by the melt.

For the melting, a natural gas flame was played from above directly over the centre of the raw mixture. The material forming the hearth of the furnace travelled at a rate of about one inch per hour. under the heat. Melting occurred on the leading edge, crystallisation on the trailing end of the molten pool. This made the process semi-continuous and provided accurate control of the cooling rate.

The melt covered itself with a blanket of viscous defluorised material which appeared as a warty crust when the mica cake was solidified. This property of the melt in automatically covering itself impeded fluoride loss and made it possible to obtain fairly pure mica by crystalising a cool hearth melt.

It was thus possible to adjust the composition of the raw material of ingredients to components for inevitable fluorine loss, assuring a uniform fluorine content of the crystals. Low fluorine mica is hard and tends to show a glassy lustre. Mica with too high a fluorine content is chalky and splittings reveal interlamellar impurities.

Mica of exceptional clarity and flexibility resulted. However, few crystal faces of sufficient size were produced, and when large faces were observed they were so thin and entangled in the crystalline mass that they were always broken in trying to extricate them. To meet commercial demands crystals would have to be produced in sizes of 1 in. by 2 in. at least, Dr. Aitkenhead believes. Only a few as large as that have been produced.

Research directors of the school state their belief that the best mixture of raw material is composed of pure potassium silicofluoride, silica, alimina and magnesia. Individual ingredients were ground together, very finely, to promote the most intimate contact between the particles. The best crystallisation was achieved in a run in which the furnace was heated to a maximum of 1510° C. in 11 hours. After two hours the temperature began to drop, indicating that melting had begun, and after 17 hours' total heating time the movement of the hearth was started and continued at a rate of 1 in. per hour for 20 hours. The furnace was cooled at a rate of 10° C. per hour for 13 hours. This test gave the best crystallisation and purest mica yet produced.

Parallel Crystallisation

The effects of seeding and rocking in efforts to bring about parallel crystallisation of larger particles were virtually nil. In one run seeding did cause parallel crystallisation to start, but less than an inch up the cake gave way to the usual random formations.

Dr. Aitkenhead says: "We do believe, however, that a considerablly deeper melt, cooled so that crystallisation from the top down would be avoided, would produce a certain yield of acceptable mica splittings, even though there was no parallelism.

(*continued on page* 430)

SULPHATE-REDUCING BACTERIA

Recent Practical Progress by the CRL

SOME outstanding evidence of the scope for the application of biological methods to industrial problems has been afforded by the investigations of the Chemical Research Laboratory into sulphate-reducing bacteria and their control (THE CHEMICAL AGE, *63*, 290). Fuller details of the odoriferous activities of these bacteria were given in a paper entitled "Sulphate-Reducing Bacteria" presented to the Society for Applied Bacteriology* by Mr. K. R. Butlin, of the Microbiology Section, CRL, who recalled what was probably the largest recorded eruption of H_2S into the atmosphere. This took place in 1938 at the small coastal town of Swakopmund in South-West Africa. Heavy sulphurous fumes emanating from the sea spread as far as 40 miles inland. According to a Press report the atmosphere was like a London fog, metalwork turned black, public clocks were obscured by deposit, thousands of fish were strewn on the beach, and sharks came into the surf gasping.

A geologist ascribed this phenomenon to sulphuretted hydrogen produced by bacteria on the sea floor from calcium sulphate or gypsum, the gas accumulating until it raised islands of mud which eventually burst.

Similar discharges occur periodically in this area. They come from a vast stretch of mud 200 miles long and 25 miles wide, lying in the Atlantic Ocean off Walvis Bay, South-West Africa. W. J. Copenhagen isolated sulphate-reducing bacteria from samples of the mud, which contained considerable quantities of sulphide.

World-wide Phenomena

Less striking pollutions of the atmosphere by H_2S occur in other parts of the world. Mr. Butlin instanced the smells which are among the less romantic features of Venice. During a recent visit he had an opportunity of seeing one of the smaller canals being cleaned out. It had obviously been used as a convenient depository for every domestic waste product liable to promote sulphate-reducing bacteria and the bottom was covered with thick black mud (containing much ferrous sulphide) emitting a foetid odour. Samples of water from this and other Venetian canals gave flourishing enrichment cultures of sulphate-reducing bacteria from which pure cultures have been isolated. One particular sample, odourless when taken, was saturated with H_2S when opened in the laboratory ten days later.

Similar conditions in Holland led to the discovery of sulphate-reducing bacteria by Beijerinck in 1895, their isolation in pure culture by van Delden in 1903, and to most of our early knowledge of these bacteria.

In Britain, as elsewhere, a serious effect of this phenomenon is the action of sulphate reducers in promoting the corrosion of ferrous pipes in clay soils. Much of the trouble caused is avoidable, and what cannot be avoided might be greatly reduced by better methods of control.

Effect on Lead Paint

The Times last year reported extensive damage to paint on the hulls of ships in London docks. "Vessels which arrived looking smart have appeared to be shabby within a few days." The shabby appearance was undoubtedly caused by the action of hydrogen sulphide, produced by sulphate reducers, on lead contained in the paint.

Most of the samples reported to the Chemical Research Laboratory in recent years have related to the nuisances caused by pollution of large pools of water. Sulphate-reducing bacteria are present in practically all soils and waters. Any stagnant body of water of sufficient depth which becomes polluted with substances containing the few simple necessary nutrients for their growth is liable, therefore, to become a crude culture of the organism.

The Chemical Research Laboratory has had opportunities for intimate contact with this problem because the surrounding district is studded with large gravel pits containing from 15 to 20 ft. of water. These are convenient receptacles for the disposal of rubbish by local authorities. Moreover, land is in urgent demand for building purposes and the considerable areas covered by the pits are reclaimed by tipping.

Towards the end of 1947, scientists from the Chemical Research Laboratory inspected two of the pits, each containing about 5 million gall. of water, about which many complaints had been received. Fre-

* Proceedings for the Society of Applied Bacteriology, 1949, Part 2.

quently householders were pestered by offensive smells, paintwork was blackened and copper and silver utensils could not be kept bright. The pools gave off a very perceptible smell of H_2S.

Seen in bulk, the water appeared black; small samples had a light brown colour and smelled strongly of H_2S. Bubbles of gas, presumably methane, were rising in many parts of the pools, being in all probability the result of bacterial decomposition of cellulosic material at the bottom.

Examination of samples in the laboratory confirmed that sulphate reducers were proliferating on a large scale, and it was suggested that the trouble might be cured by acidification. Unfortunately circumstances prevented the experiment from being carried out.

Control of Sulphate Reducers

The next venture a year later was more successful. A stagnant stream which had been greatly contaminated during the war runs behind the grandstand of a race course and obnoxious odours were causing offence. Examination of samples of the water in the laboratory showed large numbers of sulphate reducers. The addition of acid was again advised and this was carried out. Subsequent bacteriological examination showed that the number of sulphate reducers had enormously decreased, and no trouble whatever has since been experienced.

Mr. Butlin has pointed out that, where pollution is known to be inevitable, the rational approach is to prevent or limit the trouble before it starts.

The method of control by depressing the *p*H to below 5.0 is effective and the best available, but cannot be applied where the water is contained by material—*e.g.*, metals, etc.—which is adversely affected by the low *p*H. It is possible to remove hydrogen sulphide by chemical methods such as the addition of zinc acetate. This is used to prevent the contamination of coal gas by the comparatively small amounts of H_2S evolved in some gas holder waters, but would be hopelessly uneconomic where large quantities of sulphate and organic materials are continuously renewed. No antiseptic suitable for application on a large scale has yet been found.

There remains the possibility of a biological solution of the problem. One biological method is suggested by the existence of micro-organisms which utilise hydrogen sulphide for growth purposes. Ravich-Sherbo attributes the absence of H_2S in certain layers of the Black Sea to the activities of *Thiobacillus thioparus*, an aerobic organism which oxidises sulphide to sulphate.

Perhaps the most promising types of organisms for this purpose are the purple and green sulphur bacteria, photosynthetic bacteria which abound in nature and sometimes proliferate in enormous numbers. For maximum development they require hydrogen sulphide, anaerobic or near-anaerobic conditions, and sunlight. All these requirements are satisfied in polluted pools, and it might be possible to create such conditions that hydrogen sulphide produced by the sulphate reducers is consumed as it is produced. The Chemical Research Laboratory is investigating the possibilities of this method of control.

SYNTHETIC MICA EXPERIMENTS

(*continued from page* 428)

When one considers that those runs which produced fairly solid mica gave cakes six inches or less in thickness it will be realised that we have been able to gain a maximum of four inches of interrupted upward crystal growth.

"If a mica cake of proper chemical composition 1 ft.—preferably 2 ft.—thick were slowly crystallised, it is our belief that some mica of commercial size would be obtained. Probably at best over half the product would be scrap. But a yield of 10 per cent utilisable mica should be acceptable. Some, if not all, of the scrap could be reverted to the process."

A larger hearth, about 6 ft. wide, 3 ft. deep and as long as practicable, would help produce a thicker cake of mica and perhaps better and larger crystallisation. Dr. Aitkenhead also recommends that the raw material mixture be pressed into bricks under high pressure of several tons per square inch. This should compact the material to give a melting shrinkage of 25 per cent, contrasted with 40 to 50 per cent shrinkage when the mixture is tamped by hand.

Synthetic mica has essentially the same properties as natural mica, but is able to withstand much higher temperatures, states the report.

The fact that the U.S.A. has taken a leading position in the attempt to synthesise mica is to be expected, in view of the heavy use which American industries have made of the national material. The U.S.A. is generally considered to be the largest consumer of natural mica. Other countries supplied the U.S.A. with 10,000 tons of mica in 1948 and, apart from the large currency requirement, the possibility of interruption of overseas supplies of a strategic material has introduced fresh urgency into current research.

GERMANIUM FROM FLUE DUST

Growing Industrial Value of a Rare Element

by A. E. WILLIAMS, PhD., F.C.S.

GERMANIUM was discovered in 1886 by C. Winkler, a Freiburg chemist, who isolated it from the mineral argyrodite, a combination of silver and germanium sulphides, $4Ag_2S.GeS_2$. This rare element is also found in combination with sulphides of iron and copper, as in the mineral germanite, $7CuS.FeS.GeS_2$, which occurs in some parts of South West Africa. It also exists in certain regions of the U.S.A. in association with zinc compounds, and some is recovered during the production of zinc metal. Until quite recently, most supplies of germanium for Great Britain came from the latter source.

It has, however, been known for 20 years that germanium occurs in this country. In 1930 the late Professor V. M. Goldschmidt, an authority on geochemistry, isolated it from samples of Northumbrian coal. Germanium was subsequently found in numerous other coalfields in this country and abroad.

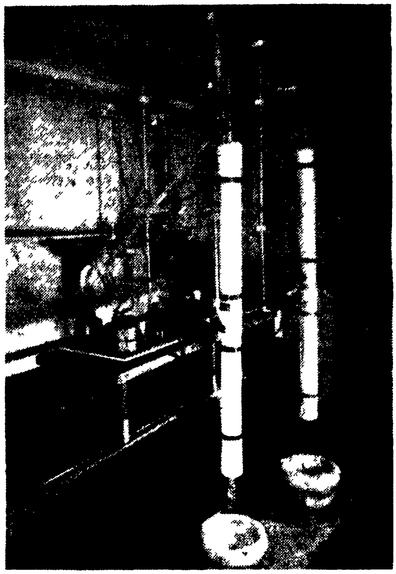
V. M. Ratinski (*Compt. rend. Acad. Sci. U.R.S.S.* 1943, 40, 198) reports that in Caucasian coals germanium is concentrated chiefly in the vitrain, which is a separable constituent of bright coal and is of vitreous appearance. He reported that the germanium content of the vitrain ash ranged from 0.1 to 1.0 per cent.

In this country, much work has been done in this sphere by the late Sir Gilbert Morgan, director of the Chemical Research Laboratory. His investigations established that germanium was not evenly distributed throughout the coal, and coal from different mines carried varying proportions of germanium.

In Oxide Form

Further investigations revealed that when coal is burnt in industrial plants much of the germanium—approximately two-thirds—was expelled as volatile sulphide and oxide of germanium. This focused attention on the prospect of recovering germanium from the flues of industrial furnaces, in which the germanium compounds form a deposit.

It was found that flue dust from gas works, for example, may contain up to 0.5 per cent germanium. Such germanium was converted to germanium tetrachloride, $GeCl_4$, by treating the dust with hydrochloric acid; the tetrachloride, which boils at about 83° C., was then distilled off. The first distillation was liable to contain some arsenic trichloride, $AsCl_3$, since arsenic was invariably present in the dust, but this impurity was eliminated by re-distilling the tetrachloride in a stream of chlorine, using a fractionating column.



By courtesy of G E C., Ltd , Wembley

Part of the apparatus used for the distillation of germanium tetrachloride

During 1945 the research laboratories of the General Electric Company at Wembley became interested in the production of germanium in commercial quantities, and collected samples of flue dust from various gas works, including those of the Gas, Light and Coke Company. Part of the apparatus which G.E.C. used for this distillation is represented in the accompanying photograph.

The samples of dust collected from different gas works contained between 0.5 and 1.0 per cent germanium, while the germanium content of the original coal was estimated to be about .002 per cent.

As the experimental work proceeded, it became obvious that different dusts reacted quite differently to the distillation

technique, as a consequence of which it was rarely possible to obtain a reliable quantitative result. When a relatively high yield was obtained, it was invariably contaminated by other volatile products.

The problem was complicated because some flue dusts were accompanied by a big concentration of a number of other elements, particularly those dusts obtained from the waste heat flues of producers, where considerable proportions of both zinc and arsenic were found. Although these producers were burning coke, under reducing conditions, some of the dust from the producers was found to contain over 1.0 per cent of germanium, while other elements such as gallium were also present. It has been estimated by the late Sir Gilbert Morgan that if only 100 million tons of the coal produced in this country each year contain germanium in the proportions found in samples from various coalfields, about 2000 tons of germanium could be recovered each year as a by-product of coal combustion.

Metallurgical Aspect

In order to achieve success on a commercial scale it was evident that the technique would have to be based more on metallurgical lines than on strictly chemical methods.

At a later stage the G.E.C. research laboratories co-operated with Johnson, Matthey and Co., Ltd., which is now thought to be the principal agency for developing methods for recovering the metal. Long investigation enabled the G.E.C. research laboratories to develop an efficient process for the extraction of crude germanium concentrates. From these they were able to distil crude germanium tetrachloride. Processes have thus been established which produce an economic yield, while the technique employed is more easily controlled on a large scale than earlier methods. At the moment, supplies of high purity germanium metal and germanium dioxide, of British manufacture, are available, and dollar purchases in the U.S.A. have been reduced.

Uses in Electronics

Although germanium has been known so long, it has remained until quite recently little more than a laboratory curiosity. One of the uses for germanium is in electronics in which germanium crystals are of value as semi-conductors.

The interest of the research laboratories of the G.E.C. in producing germanium in appreciable quantities was stimulated by its great value in several devices essential in tele-communications work. As the wavelengths employed became shorter it was found that the usual thermionic valve was not efficient, so that the old-fashioned crystal technique—using a crystal and "cat's whisker"—was adopted. During the second world war silicon crystals were used in large numbers and the properties of other semi-conductors were studied. Among these, germanium exhibited particular properties which permitted the construction of rectifiers which, with special circuits, could be substituted for the diode type of thermionic valve.

The relatively high price of germanium metal which prevailed earlier probably accounted for the absence of any appreciable amount of research into its metallurgical properties. Now that the metal is available for experimental purposes important applications for it will no doubt be found, such as its use as an alloying agent in other metals.

Some of the fundamental properties of germanium are these: Atomic weight 72.6, melting point 959° C., specific gravity 5.47, hardness (Moh's scale) 6. E. Gebhardt (Z. *Metallk.* 1942, **34**, 255) has shown that zinc and germanium form a simple eutectiferous system with the eutectic at Ge 6 per cent and a temperature of 398° C. He also reports that zinc dissolves less than 0.1 per cent germanium at a temperature of 380°C. H. Westlinning and co-workers (Z. *Electrochem.* 1948, **49**, 198) report the solubility of a magnesium-germanium compound, Mg_2Ge, in aluminium at 500° C. as 0.2 mol.-per cent, as determined by X-ray and microscopical examination of quenched samples. They report that the solubility decreases rapidly with falling temperature.

Medical Products of Harwell

DETAILS of the new product of the Harwell atomic pile, Ir192, which, it is thought, may take the place of radium in the treatment of some skin diseases, were presented to medical workers this week at the Scottish Hospitals and Public Health Exhibition, at the McLellan Galleries, Glasgow.

The new isotope is stated to be not only cheaper and more plentiful than radium—it costs £12 to hire one dose for four weeks—but, because the radiation it emits is less powerful than that of radium, it can be used for treating skin disorders without danger of harming the deeper bone structure.

Other atomic products for medical use displayed at the exhibition were isotopes of sodium, used for studying blood circulation, and of iodine.

THE CHEMICAL STRUCTURE OF COAL

New Evidence from the Carnegie Institute

SOME interesting news of work in progress at the Coal Research Laboratory, Carnegie Institute of Technology, Pittsburgh, is given in the current issue of the *Quarterly Gazette*, of the British Coal Utilisation Research Association.

One of the several problems being tackled, states the BCURA, is that of hydrogenation. The objective of the coal hydrogenation programme is to study the constitution of coal by decomposing its substance into less complex constituents under relatively mild conditions. This also provides data important to a better understanding of the processes involved in the production of motor fuels and all other products obtainable by coal hydrogenation.

The conditions under which hydrogenation is achieved (time, temperature, type of coal) are systematically varied and an analysis is carried out as far as possible on the products obtained in the first stages of liquefaction.

The product of the alkaline oxidation of powdered coal, a yellowish powder, is a mixture of aromatic acids, some of which are of the simple benzenoid type like phthalic acids; others are much more complex. The relative thermal instability and colour of the product, however, limit its potential market in the plastics industry. The present phase of laboratory investigations is intended to elucidate the structure of the more complex acids present.

Indene and Benzofuran Ring Systems

Among other results, the fractionation of the hydrocarbons recovered from hydrogenolysis of the butyl esters has indicated the presence of indene and benzofuran types of ring systems. This is the first direct evidence of the presence of structures more complex than the benzene in oxidation products from ccoal.

The decarboxylation reactions have shows the presence of fluorene which is a 8-ring structure with a 5-membered ring between two benzene rings. Solvent extraction permits the separation of coloured and thermally unstable constituents in the mixture from the benzene carboxylic types. These investigations contribute not only to the development of methods of preparing commercial chemicals from coal, but also to the knowledge of its chemical nature.

Several research projects are studying the properties of the so-called C-O complex which exists at the interface of the carbonaceous materials and the oxidising atmospheres. One approach is through oxygen transfer measurements in the successive reduction by H_2 or CO and oxidation by CO_2 at 500-700° C. of graphite, coke and other carbonaceous materials.

Use of Radioactive Carbon

Another method aims at determining the rate of oxygen exchange between CO and CO_2 on the carbonaceous surface. Since net effects of such changes are not easy to follow using the usual chemical methods, one of the oxides of carbon is labelled with radioactive carbon C^{14}. Some workers believe that H_2 and CO can block active sites on the carbon, an opinion which is not universally shared. The retarding role of H_2 and CO in gasification could be attributed to the fact that they could compete with the solid carbon for the oxgen deposited on the surface.

Another approach to the same question of inhibition by H_2 and CO is being investigated by means of adsorption measurements in a circulating system. Fluidised beds have been used to study C-O reactions. Studies of gas flow in fluidised systems, needed for the interpretation of reaction rate data, have incidentally led to a means of estimating coke particle density.

A further research aims at studying the elutriation from a fluidised catalyst bed. Work on the combustion of pulverised coal in self-supporting flame is concerned with the effect of particle size, the air to coal ratio and temperature on the transition from particulate ignition to a flame front.

Welding Research

THE stresses to which a welded structure is subjected through the course of its life was one of the subjects of research shown to the Press at the Abington centre of the British Welding Research Association on September 19. Interest chiefly focused on a new pulsating pressure plant which has recently been installed at the research station to test welded vessels and various materials by repeated applications of pressures. These machines are manufactured by a German firm in Stuttgart and it is claimed that there are only a dozen of them in the world, of which two are in the U.K.

Biological Approach to Rat Poisons

U.S. Adopts Analogue of Dicumural

A NEW poison with a specific toxicity for rats and mice has recently been approved for general sale in the United States. It is a synthetic substance—3-(acetyl-benzyl)-4-hydroxy coumarin, obtained by condensation of 4-hydroxy-coumarin with benzaldehyde. First produced in 1942, the poison was known in its early stages of development as "Compound 42" but has recently been given the official generic name of warfarin.

The chemical history of warfarin is exceptionally interesting, for its discovery was the incidental result of an entirely different line of research.

In 1934 there was a considerable amount of sudden and inexplicable death from haemorrhages among cattle in the United States and Canada. Dr. Karl Link, of the University of Wisconsin, traced the haemorrhages to a toxic factor in damaged sweet clover, which was eventually isolated and identified. Its possible use as a clinical agent to prevent post-operative blood clotting and to treat thrombosis was investigated, and it is now considerably used for these purposes under the name of Dicumural.

Extreme Anti-clotting Properties

Large numbers of analogues of this chemical were synthesised in the hope that an even more effective anti-clotting drug could be developed. Among these was Compound 42 or the new warfarin. Numbers of rabbits on which warfarin was tested bled to death when blood samples were later taken, an "excessive" effect not experienced with any of the other anti-clotting substances. This effect was not further investigated at the time because of more urgent war-time problems.

In 1947, however, some of these analogues of Dicumural were re-investigated, using rats and mice as the test animals, and it was again found that Compound 42 was particularly potent as a direct stimulator of haemorrhage. It was found that quite small doses given over a few days were much more toxic than one large dose. Test figures revealed that 100 mg. per kg. body weight were needed to obtain 75 per cent mortality in one dose, while only 7.5 mg. per kg. body weight, consumed over five days, gave 100 per cent mortality.

Further tests showed that it was tasteless and odourless and that there were no warning symptoms from the small doses first developed, and because most rats and mice keep to the same feeding-grounds, the regular presentation of this poison was not likely to fail in its purpose. Extensive tests, carried out in 1949 in many parts of America, confirmed this assumption. Rats die from internal haemorrhages after consuming several days' doses; there is no external bleeding, though a rat which injured itself within a short time of receiving the poison would probably die sooner by bleeding to death. One figure given for the amount to be incorporated in baits for rats or mice is as low as 1 part in 10,000.

The other important feature of any rodenticide is its toxic hazard to friendly animals and to man. Warfarin enjoys a safety factor in that the toxic dose is directly related to body weight. It is claimed that cats, dogs, or children would have to eat very large amounts of the poisoned bait to suffer ill effects. The general release of the new poison in the United States indicates that warfarin is considered to be safe. Vitamin K is an effective antidote should large amounts be accidentally consumed.

Manufacture of the synthetic substance is covered by U.S. Patents 2,427.578-9, which are owned by the Wisconsin Alumni Research Foundation.

A detailed treatment of this subject has appeared in :
Chemical Industries, 1949, 65, *1*, 31-32.
ibid, 1950, 67, 2, 232
Agricultural Chemicals, 1950, 5, *8*, 65.

Dollar Exports of Lanolin

BRADFORD Corporation is beginning to earn dollars from its exports to the U.S.A. of the lanolin salvaged from the grease waste from the wool scouring process. Difficulties and delay in obtaining export licences were experienced, and there was an even longer delay in getting the U.S. import permit, partly because lanolin is classified there as a wool grease derivative, which until recently was subject to import control.

The necessary licences were eventually granted and, although Bradford has secured only a comparatively small share of the U.S. market—Germany has been making much heavier shipments, and there are substantial Dutch exports of lanolin to the U.S.A.—substantial and growing quantities are now being shipped.

Technical Publications

EFFICIENT operation of boiler plant largely depends on accurate observation of the many measuring devices now available. Unit instrumentation for small boiler plants is described in an illustrated booklet by George Kent, Ltd. The complete unit records draught at various stages, steam flow, CO_2 and temperature, while the Kent RW/C meter may be used to measure the water feed to a battery of boilers. A typical lay-out and installation notes are also provided.

* * *

PRACTICAL use of synthetic rubber has been the subject of a series of 22 ss-circulars containing more than 400 reports on the compounding and processing of synthetic rubber by rubber manufacturers The final circular (No. ss23) consists of indexes prepared for the Ministry of Supply Advisory Service on Rubber and Plastics by Mr. T. R. Dawson, of the Research Association of British Rubber Manufacturers. The information was issued confidentially under the U.S.-U.K. liaison scheme.

* * *

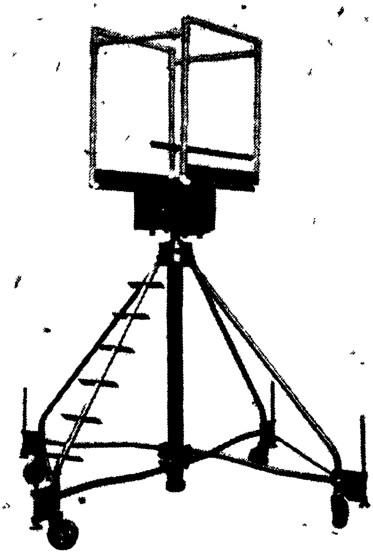
A CHEMICAL treatment which increases the resistance of tinplate to rusting and to staining by sulphur products is reviewed among the recent technical literature of the Tin Research Institute. The Protecta-tin process is preferably carried out on freshly tinned plates, but it is quite practicable to treat filled and sealed cans in order to increase resistance to external rusting.

* * *

APPLICATION of high nickel alloys in aircraft construction is given special treatment in " Wiggins Nickel Alloys " (No. 327, published by Henry Wiggin & Co., Ltd., Birmingham). Illustrated articles are devoted to the use of Inconel in aircraft engine exhausts, nickel-iron alloys in fire detector equipment, and thermal de-icing of windscreens, employing nickel-chromium resistance wire.

* * *

ACTIVITIES of the Atomic Scientists' Association reported in the president's speech at the annual general meeting in Birmingham are summarised in the August issue of the " Atomic Scientists' News." Articles are devoted to lectures given at a conference on Isotopes in Industry held at Birmingham in May. The first three lectures at this conference were reported in the previous issue.



By courtesy of William Moss & Sons, Ltd.

A mobile alternative to the access ladders required in various forms of chemical plant is the " Beanstalk " which provides platform heights up to 17 ft. by skilful use of tubular frames and a triple hydraulic ram. The manual pump permits full elevation in two minutes, and 45 seconds are required to descend

COBALT, nickel and selenium in pottery are described in a treatise by W. H. Webb, published as a brochure by the Mond Nickel Co., Ltd. Analyses of cobalt oxides and salts are given, with useful lists of references. There are a number of excellent colour reproductions.

* * *

THE potential market for aluminium in the canning industry is re-emphasised by the development in Germany of a new type of aluminium container lined with a protective lacquer which enables it to withstand chemical attack by foods. A special characteristic of this container is the sealing arrangements contained in the lid. The design is described, with illustrations, in the August issue of " Aluminium News " (Aluminium Union, Ltd., Montreal, Canada).

The Chemist's Bookshelf

STRUCTURE OF MOLECULES AND THE CHEMICAL BOND. Y. K. Syrkin and M. E. Dyatkina. Translated and revised by M. A. Partridge and D. O. Jordan. Butterworth Scientific Publications, 1950. Pp. x + 509. 63s.

Latterly, the inorganic chemist has reached a proper realisation that structural studies are as important in the inorganic field as for years they have been recognised to be in the organic field. There is, therefore, an increasing tendency to discuss simultaneously, with no suggestion of dissimilarity, matters of bonds and reaction mechanics as applied both to organic and inorganic substances. This development has considerable advantages, particularly perhaps for the inorganic chemist, though it is clear that benefits are to be derived on both sides.

Both theoretically and experimentally there have been many recent advances in our ideas of structural chemistry, right from the conception of atomic orbitals up to the structure of complex molecules. The development of wave mechanics, for example, has permitted an increased understanding of such subjects as the forces between atoms in molecules, while the wide application of physical methods to structural investigation has enabled the theoretical deductions to be tested practically, and in many cases to be extended or modified.

The Russian authors of this book, which was first published in 1946, have aimed at presenting a coherent account of the field which discusses both theoretical and practical aspects as an integrated whole. The translators have, in addition to their basic task, modified and revised the content in the light of later developments, so as to give an up-to-date survey of a difficult but a highly important aspect of modern chemistry. Starting from the classical and semi-classical views of the structure of the atom, brief but adequate discussion is given to the development of wave mechanic concepts as applied to simple atomic structure, and the relation of this to the periodic classification as a whole. This is followed by an account of the development of ideas on the chemical bond, with particular reference to covalency and resonance, and leads directly to discussion of the relation between electrovalent and covalent binding, and the existence of intermediate bonds.

Up to this point the Heitler-London atomic orbital method has served as an adequate basis for the treatment. The molecular orbital method is now introduced, and is considered in its application to diatomic and polyatomic molecules, always correlating, as far as possible, the results of theory with practical physical measurements. Several chapters are devoted to such important problems as spectral measurements, dipole moments, bond energies and intermolecular forces. A consideration of the structure of crystals follows logically on the last of these. There is next a considerable chapter on the structure of complex compounds, and a smaller chapter on the controversial boron hydrides. The three final chapters are concerned with more advanced mathematical treatments of polyelectron and related problems, and derivations for the material discussed earlier in the book.

Although the book is not easy reading, and requires for its full understanding considerable mathematical knowledge, all that is possible has been done to present the information as simply as is compatible with a reasonably full treatment. The non-mathematical reader will therefore gain a considerable insight into the present state of our knowledge of this subject if he is content to skip those parts, usually conveniently segregated, which are beyond his abilities, and to accept the derivations arrived at in the book. Quite a large proportion of the five hundred pages are readily intelligible to anyone with an average chemical background. In turn, the mathematical reader will find collected under one cover a useful survey of a field in which much of the information has hitherto been rather widely scattered.—C.L.W.

MR. WILLIAM H. TROTTER has been appointed to handle the sales promotional activities of the Chemical Division of Celanese Corporation of America. His experience includes service with the chemistry departments of the University of Maryland and the U.S. Bureau of Standards.

OVERSEAS CHEMISTRY AND INDUSTRY

U.S. MINERAL AND METAL PRODUCTION

Higher Levels of Some Strategic Materials

PRODUCTION of native sulphur in the U.S.A. in June totalled 487,845 long tons, according to reports of producers to the Bureau of Mines, U.S. Department of the Interior. This was the highest figure achieved for any single month and brought the total for the first half of 1950 to a record of 2,543,443 long tons, compared with 2,383,473 for the same period of 1949.

Apparent sales of sulphur were calculated at 407,405 long tons, which was 8,641 long tons more than June last year, but 77,690 long tons less than in May, 1950. Producers' stocks at 2,956,338 long tons were 80,440 long tons better than the previous month, and showed the first improvement for a long time.

Aluminium and Bauxite

Primary aluminium production in the U.S.A. in June reached a total of 60,400 short tons. Although this showed a two per cent decline because of the shorter month, the average daily rate of output established a peace-time record. The basic price remained unchanged throughout the month. Stocks at the end of the period were 14,500 short tons, compared with 16,341 short tons in May. Net imports decreased 35 per cent to 9251 tons, as receipts from Canada declined for the third successive month. Imports of semi-crude aluminium from the U.K. were also lower.

The greatest production of bauxite for a three-month period since 1948 was attained in the second quarter of 1950 with a total of 359,938 long tons (dried equivalent).

Despite a decline from Surinam, the largest foreign source, imports in the period April-June were marked by an increase over the same period of 1949 and were also higher than the first quarter of this year. Receipts from both Indonesia and British Guiana gained, the former reaching the high level of 184,728 long tons, compared with 167,890 long tons in April to June 1949, and 114,241 long tons in January to March, 1950. Exports to Canada totalled 7566 long tons, a decrease of five tons per cent.

New Brazilian Sources of Fuel and Chemicals

BECAUSE the international situation may curtain supplies of fuel before Brazil can develop her own natural petroleum sources, the Security Council has recommended the development of the abundant national reserves of bituminous schists. The refinery at Cubatão, near Santos, which was to begin processing 45,000 barrels daily of imported crude oil in 1953, may be used to produce shale oil from the impregnated schists of the Paraiba Valley, where the geological formation known as the black Irati schists extends for hundreds of miles. The layers vary in thickness from 100 to 200 ft., and favourable conditions for commercial exploitation exist at many points.

Besides oil, the distillation of shale yields gas of high calorific power, for domestic and industrial purposes and in the production of synthetic ammonia and ammonium sulphate. Another product is a powerful insecticide, now used industrially in Brazil, while the final residue of the shale, in powder form, is also employed as an insecticide. This residue also serves to filter and deodorise vegetable and mineral oils, purify polluted water and fill plastic materials. Used as pozzolana it improves the quality of Portland cement.

A private company, with a capital of £320,000, is already extracting oil from the bituminous schists at Pindamonhangaba, in San Paulo. The first retort has been brought into service and three others will begin operating this year, giving an initial output of 8000 litres of crude oil. The company will use part of the gas produced as fuel. The surplus, amounting to about 300 cubic metres per 1000 kilos of oil, will be marketed.

Another company has been exploiting a small part of the Tremembé-Taubaté deposits in the Paraiba Valley for some years and modern plant has now been acquired to produce 3300 gallons of fuel oil daily. The beds worked by the company are capable of yielding 20,000 barrels daily for many years. Samples analysed by the U.S. Bureau of Mines yielded 86.5 gallons of petroleum per ton, or 6.5 gallons more than the famous Colorado schists.

European Fertiliser Programmes

Russian Claim for a Potent Bacterial Method

THE Russians are said to be using this year a new fertiliser stimulant called Nitragin, containing root bacteria which aid the plant to assimilate atmospheric nitrogen. According to one Soviet source, about 1.5 litres per hectare would be capable of doubling some crop yields. Some 1½ million hectares are being treated with the new preparation this year. The possibility cannot be excluded that litres is a misprint for some larger unit). In addition to use of K, N, P. and Ca fertilisers, on certain experimental areas, some crops are being treated with compounds of other elements in increasing amounts, such as those of B and Mn, for beet, and of Cu for peat and grassland.

The significance of trace elements, to which so much attention has been directed in recent years, has not been ignored in Russia. Numerous compounds in very small amounts are being tested, such as those of Mo, Co, I, Mn, Cu, Zn.

It is planned this year to produce 5.1 million tons of N, K and P fertilisers in roughly the following proportions: N 1.3 million tons; K 1.1 million tons; and P 2.7 million tons. These are estimates: actual outputs may be larger. Export trade is being developed both in potash and nitrogenous fertilisers.

Italian Production

Production of superphosphates in Italy in 1949 was 1.4 million tons, representing a considerable increase over preceding years, although still below the capacity of reconstructed works (1.8 million tons). A substantial amount was exported. Crude phosphate was imported from N. Africa (725,000 tons) and the balance of about 100,000 tons from the U.S.A. and Egypt. Total exports of fertilisers from Italy in 1949 were 268,290 tons, compared with 124,254 tons in 1948.

Austria

The nitrogen fertiliser factory at Linz, Austria, with an output in March of 30,000 tons, reached its maximum level of production of calcium-ammonium nitrate. The total production of this in 1949 was 288,000 tons. Exports in the first quarter of 1950 amounted to 140,000 tons, and exceeded production, the principal customers being Poland, Spain, Czechoslovakia, Jugoslavia, and Holland. For the season 1949-50, several export agreements were established for nitrogenous fertiliser supply, largely in the form of barter or compensatory arrangements. The home demand this year for calcium-ammonium nitrate is estimated at about 85,000 tons.

French Output

For the first four months of 1950 fertiliser production in France was as follows (in 1000 tons):—

	Jan.	Feb.	Mar.	Apl.
Superphosphate	109.5	96.2	92.2	80.0
Synthetic N (in terms of N)	19.2	17.0	15.4	17.0

These figures represent a decline in the monthly average of superphosphate which was 100,000 tons in 1949, 140,000 tons in 1948, and 114,000 tons in 1938. The monthly average for synthetic nitrogen has risen somewhat.

Belgium's production of nitrogenous fertiliser in 1949 was 167,200 tons as against 156,722 tons in 1948 (reckoned in N). It is expected that in 1950 the production will maintain last year's level or a little higher.

East German Efforts

Last year's export from East Germany of 28,000 tons of nitrogen to China is to be approximately doubled this season. An agreement between the Soviet Union and Communist China provides for supply of N fertiliser from Russia, of which about 200,000 tons per annum is required.

Sweden

Superphosphate production by the three largest works in Sweden in 1949 was 436,500 tons. Crude phosphate was imported from U.S.A. and Russia.

U.S. Potash Output Increasing

POTASH deliveries during the second quarter of 1950 in North America by the five major U.S. producers and three importers totalled 698,247 tons of potash salts containing 392,687 tons of K_2O. This is stated to have constituted a record high level. The figures represent an increase of 16 per cent in salts and 21 per cent in K_2O over the tonnage delivered during the corresponding period of 1949. Imports comprised 57,044 tons K_2O of the totals quoted.

NEW PLANT AND PRODUCTS IN S. AFRICA

Chemical Factories Under Construction

From OUR CAPE TOWN CORRESPONDENT

THE new factory being built by General Chemical Corporation at Industria, Johannesburg, is to occupy five acres of the company's 40-acre site. It is expected to be completed by November. The factory will be equipped with modern mechanised methods of chemical production, filling, packing, etc., and the building and grounds will cost nearly £100,000. Production is to include about 150 general chemical products such as adhesives, cleansers, disinfectants, insecticides, waterproofing compounds and lubricants. This firm is making Izal under licence from Newton, Chambers, & Co. It has another factory in Natal. It is planned to develop the rest of the Johannesburg site as an industrial township.

* * *

The Texmaco Supply Co., 514 Maritime House, Loveday Street, Johannesburg, is to form a local company with an initial capital of £10,000 for the production of textile chemicals under licence from the Swiss company Erba. Production may begin early in 1951. The factory will be erected on the Rand and is intended to produce a wide range of chemicals, including those for the cotton preparing and finishing processes, sizing and desizing, starching and bleaching, for the impasting of dyes, for equalising and after-treatment and soaping. A preparation will be made for impregnating raincoats, and others for application to wool and for a number of other textile purposes. This will be a specialised industry of a type new to South Africa and it is expected that some overseas capital will be invested in the project. A chemical fireproofing substance for textiles, among the new products, is likely to find fairly widespread acceptance.

* * *

Foamed resin as an adhesive, primarily intended for the plywood industry, is in active manufacture at East London by a firm specialising in the production of synthetic resins, emulsions, etc., for various industries. This firm lately added to its range three new types of adhesives, never before made in the Union. Two of these have special water-resisting properties and are intended mainly for the production of waterproof plywoods, although they can be used equally well where any water-resistant bond is required. The third type is designed for the bonding and joining of all woods and may be used equally well for paper, leather, cork and almost any porous material, the makers state. When mixed with natural glues, it is stated to confer improved adhesion and water-resistance, but, unlike the natural products, is not attacked by mould or fungus.

* * *

Brooklyn Laboratories (Pty.), Ltd., Wren Street, Brooklyn, Cape Town, is making copper naphthenates for the treatment of timber against boring and other insects, and zinc naphthenates as rot preventives and to guard against fungus, mildew, etc. It is hoped that considerable quantities of the copper naphthenate will be sold to the local fishing industry as it has been approved by research scientists for the impregnation of fishing nets. It is claimed that the metallic chemicals made by this company are non-leaching, readily soluble in mineral spirits and have deep penetration. The company is also making anti-fouling copper paints, waterproof, anti-corrosive sealer paints, and similar compounds. Apart from the electric motors, most of the machinery used in this factory was designed by the company's directors and made in Cape Town.

* * *

Chromium oxide (chrome green) and zinc chromates have been added to the regular output of pigments by a well-known firm of chemical manufacturers at Germiston. The former is needed by a number of local industries. The zinc chromates are being made to stringent specification for use as rust inhibitors and to provide protective coatings.

* * *

A further increase in profits to £88,764 is shown in the accounts of National Chemical Products, Ltd., whose sales in 12 months rose by £107,600 to £810,600. The directors state that profits would have increased more if supplies of molasses had not been severely restricted in the last months of the financial year owing to insufficient rainfall in the sugar-cane area during the preceding season.

French and Belgian Rubber Research

Current Activity of the Specialist Institutes

THE view that synthetic rubber was a misnomer, since the chemical structure of the synthetic was quite different from that of the natural product, was expressed in a paper concerned with the recent publication (1950) in Paris entitled "Les Dérivés Chimiques du Caoutchouc Naturel." The authors of the latter were Dr. J. le Bras, inspector general of the Institut Français du Caoutchouc and of the Institut des Recherches sur le Caoutchouc en Indochine, and M. Piganiol.

In his commentary at the Belgian Rubber Congress at Brussels recently, Dr. le Bras called attention to the authors' conclusion that it would be more logical to speak of "artificial rubber." In some quarters, in fact, "chemical rubber" was finding favour as the correct designation.

The question of the probable future of natural and artificial rubber could not ignore their mutually complementary attributes rather than their sharply competitive aspects. Dr. le Bras thought there was certainly room for both in view of the rapidly expanding and widely varying needs of industry and science.

Work on High Polymers

The congress is reported in *L'Ind. Chim. Belge*, 1950, 15, *4*, 219-232, which also gives a summary of a paper by Mr. J. T. Fitzgerald, of the Polymer Corporation, Ltd. (Canada), on high polymer progress.

Mr. Fitzgerald described the works of his company at Sarnia (Ontario), its research organisation, and the evolution of its principal products, notably butyl polymers and the Polysar-S range. Research and development there, he said, comprised six sections: polymerisation, physical research, a pilot plant for rubber of the Polysar-S type, mixing technique, specifications and standards, and butyl research. It was at Sarnia, he claimed, that the first success was achieved in polymerising butadiene with acrylonitrile in a GR-S plant, in which low temperature was an important factor.

Special attention had been given to low temperature resisting rubber of butadiene-styrolene base, which would withstand temperatures of $-62°$ or even lower; in the Gehman test it hardened completely only at $-78°$ C. The value of lignine as a stabilising and strengthening agent was also emphasised by Mr. Fitzgerald.

M. Reichert, discussing the ISO (International Standards Organisation), with particular reference to the work of the Comité Technique No. 45, dealing with rubber standards, complained that Belgium so far had contributed nothing to the work and proceedings of the ISO or Comité 45. That was hard to account for, in view of the country's extensive rubber plantations in the Congo and the considerable rubber industry in Belgium.

French Research

In reply to a series of questions by M. A. R. Matthis, president of the Association Belge des Techniciens du Caoutachouc, which organised the congress, Dr. le Bras gave some information on the history, organisation and programmes of the two institutes of which he is scientific director-general, the one in Paris and the other in Indo-China, both under the same governing council. L'Institut Français du Caoutchouc had three departments—of documentation, research, and application. The research centre undertook a varied programme both in chemistry and physics, and also organised courses of instruction for young specialist engineers.

The Centre d'Application had the task of extending the uses of rubber in every possible way, working in close touch with the research department, and its work included a considerable amount of technical and scientific publicity. The institute in Indo-China was chiefly concerned with rubber cultivation problems.

Valuable progress had been made in Indo-China in conjunction with the planters, both with natural rubber and the vulcanised products.

Plant Source of New Antibiotic

A NEW antibiotic, said to have shown high potency as a fungicide, has been isolated in the Vermont Agricultural Experimental Station, U.S.A., by Dr. John Little, head of the department of agricultural biochemistry. The compound, tentatively called Plumericin, from the name of the source, *Plumeria multiflora*, has shown some activity in the laboratory against certain bacteria, including one strain of tuberculosis organism.

Plumericin, which is novel in the antibiotic field in that it comes from a plant, was found in the course of an intensive search for new medicines from tropical plants. More than 1700 plants would be tested.

OVERSEAS

Spanish Firm's New Medical Products

Production of a number of new medical supplies such as special local anaesthetics, an anti-malarials, other than quinine, and penicillin pills has been started by Azamon, a Spanish firm affiliated to I.C.I., Ltd.

New Zealand Coal De-Nationalised

A Bill to restore unworked coal in New Zealand to private ownership was introduced last week by the Conservative Premier, Mr. Sidney Holland. Royalty mortgages, coal leases and other contracts cancelled by the 1948 Act of the Labour Government will be re-instated. All money received by the Crown will be refunded to the owners.

Australian Metal Prices

Prices of domestic lead and zinc were raised in Australia this week to £65 a ton for each metal, which represented increases of £30 for lead and £25 for zinc. World prices for these metals in Australian currency are equivalent to £160 a ton for lead, and £175 a ton for zinc. The marked disparity between overseas and Australian prices has long been the subject of protests by the producers.

Mounting Output of U.S. Chemical Industry

The chemical industry has shown the highest growth rate of any major section of the United States economy, according to Dr. Raymond H Ewell, manager, Chemical Economic Service of the Stanford Research Institute. Chemical industry in America has grown from an output worth $600 million a year in 1925 to $5000 million a year in 1949. This rate of growth is three times as high as the average of all United States industry.

U.S. Chemical Engineering Studies

The University of Wisconsin chemical engineering department provided three papers for the regional meeting of the American Institute of Chemical Engineers, held recently in Minneapolis. They dealt with the subjects of catalytic oxidation of nitric oxide, reporting a step in a recent process for converting nitrogen from the air into fertiliser, by H. N. Wong, Ralph Baker, and Professor O. A. Hougen; vapour phase catalytic esterification, by R. A. Buckley and Professor R. J. Altpeter; and freeze drying with radiant energy. The last, by W. H. Zamzow and Professor W. R. Marshall, was a valuable study of drying heat-sensitive materials such as plasma, antibiotics, and food.

U.S. Aid for French Oil Refinery

France is to receive assistance from the Economic Co-operation Administration towards the rebuilding of the oil refinery at Dunkirk. The total of the grant from ECA will be $4,005,000 (£1,430,000), sufficient to cover all dollar costs. Total cost of the reconstruction is estimated at £13 million.

Colombian Caustic Soda Plant Opens

The new caustic soda plant near Bogotá, Colombia, financed by the Banco de la República, was officially opened at the beginning of August. It is likely that production will start in six months' time and the daily output is then expected to be 55 tons of soda ash, 25 tons of caustic soda, 4 tons of bicarbonate of soda and 200 tons of refined salt.

Labelling Goods for Ecuador

A decree issued by the Ecuadorean Government prohibits the import into that country of pharmaceutical, antibiotic and some other specialised products which are not individually labelled and provided with literature printed in Spanish. These may, however, also have texts written in any other language. An exception may be made for products imported by medical and similar bodies.

Peru's Prospective Cellulose Industry

A delegation from the Peruvian Amazon Corporation is visiting Rome with the object of founding a national cellulose industry in Peru. The delegates have carried out experiments with experts from the Italian cellulose industry, using wood from the Amazon forests. The pulp produced is believed to furnish an excellent quality of cellulose, well suited for the manufacture of newsprint. The mission hopes to obtain Italian specialised labour and financial participation.

Japanese Titanium Dioxide

Japan is soon to start the manufacture of titanium dioxide. According to SCAP's Economic and Scientific Section, the Nippon Titanium Company has been formed for this purpose under joint American and Japanese sponsorship. Both American and Japanese capital will be invested in the new venture and the company is expected to be in full operation by January, 1951. Japanese indigenous iron ore and a patented process developed by Dr. Kyozo Ariyama, a graduate of the University of Minnesota, U.S.A., will be used.

PERSONAL

MR. MARK H. HEYWOOD has joined the board of P. B. Cow & Co., Ltd., as technical director. He has an international reputation as a rubber technologist, with over 30 years' experience in the industry. For the past 20 years he has been chief chemist to the English Firestone organisation. He is a member of many professional institutions, and is a Fellow of the Royal Institute of Chemistry and the Institution of the Rubber Industry. Among his many appointments he has served as a representative on the Parliamentary and Scientific Committee. In 1944 he was one of the team responsible for the conversion of the French tyre industry to the use of

MR. M. K. SCHWITZER, of Bamag, Ltd., the chemical, gas and oil engineers, has returned from a visit to Iran where he studied problems arising out of the progressing industrialisation of the country. At the request of vegetable oil interests he spent also some time in Turkey and in other Mediterranean countries. The continued high prices which vegetable oils command in the world market and the increased home demands for high quality products are enforcing substantial changes in the vegetable oil processing technique.

At the opening of the international congress to combat tuberculosis in Rome, 500 doctors representing 43 countries presented a gold medal to SIR ALEXANDER FLEMING, the British discoverer of penicillin. The congress was convened by the American College of Chest Physicians.

MR. H. A. R. BINNEY, an Under Secretary of the Board of Trade, has been appointed deputy director of the British Standards Institution.

Davey, Paxman & Co., Ltd., the Colchester engineers, announce that MR. J. P. ELLIOTT, secretary and chief accountant of the company, has been appointed a director of the company.

MR. DAVID OWEN HUGHES, of Gwenllys, Llangefni, Anglesey, at one time on the agricultural chemistry staff at Bangor University, left £5575 (£5454 net).

MR. T. MAY-SMITH, 9 Spareleaze Hill, Loughton, Essex, retired manufacturing chemist, and former director of A. Boake, Roberts & Co., Ltd., left £31,785.

LT.-COLONEL SIR WILLIAM WAYLAND, lately chairman of W. A. Wayland & Co., Ltd., manufacturing chemists, of Deptford, left £53,662.

NEXT WEEK'S EVENTS

MONDAY, SEPTEMBER 25

Institution of the Rubber Industry

Manchester: The Engineers' Club, Albert Square. 6.15 p.m. "Safety and Accident Prevention in the Rubber Industry" by R. W. Lunn.

The Faraday Society

Cambridge: The University. General discussion on "Spectroscopy and Molecular Structure—Optical Methods of Investigating Cell Structure." Until September 28.

TUESDAY, SEPTEMBER 26

Society of Chemical Industry

London: Waldorf Hotel, Aldwych, W.C.2. 6.30 p.m. "The Chemical Industry and Plastics" by Dr. R. G. Heyes (chairman of the London section of the Plastics Institute).

THURSDAY, SEPTEMBER 28

Society of Chemical Industry

London: Burlington House, W.1. 6.30 p.m. "Elastic and Viscous Properties of Polystyrene in Solid and Liquid States" by Dr. H. W. Mohrman. British Rheologists' Club invited.

Laundry, Dry Cleaning and Allied Trades

London: Grand Hall, Olympia. Exhibition. Until October 7.

FRIDAY, SEPTEMBER 29

Society of Chemical Industry (Food Group)

London: Marks & Spencer, Ltd., Paddington Street, W.1. 6 p.m. Fourth Conversazione. Until 10 p.m.

OCCA (Manchester Section)

Manchester: Cheetham Town Hall. 6 p.m. First Post-Graduate Lecture: "Topics in Colloid Chemistry" by Dr. A. S. C. Lawrence.

Royal Statistical Society

Sheffield: The University. Conference on "Scientific Method in Industrial Production." Until October 1.

Danish Chemists' Visit

The Food Group of the Society of Chemical Industry has made arrangements for a small party of Danish chemists who will be staying in this country from September 24-October 2, to visit food factories and other places of interest. Members of the Food Group will have an opportunity of meeting members of the party at the conversazione to be held at Marks and Spencers, Ltd., Paddington Street, W.1, on September 29.

HOME

Tar Distillers' Extension

Scottish Tar Distillers, Ltd., of Falkirk, is to undertake extensions at Camelon at a cost of £8145.

KID Exemptions

The following chemical materials have been exempted from Key Industry Duty for the period beginning September 11 and ending December 81: *p*-nitrotoluene, *o*-anisidine, mono chloroacetic acid, diethylamine, ethylenediamine hydrate.

£100 for RAF Charities

Staff and workers at the Ardeer factory of I.C.I., Ltd. (Nobel Division) at Stevenston, Ayrshire, have sent £20 to the RAF Benevolent Fund. This brings to £100 the total amount received by the RAF Benevolent Fund from this source during the past year.

Metal Prices Raised

Cadmium prices were advanced on September 18, from 15s. 6d. to 17s. 3d. per lb. delivered. An increase was also recorded in wolfram ore, which was quoted in London nominally at 220s. to 225s. per unit c.i.f., compared with 215s. to 225s. on September 13.

Scientific Photographs at RPS Exhibition

Among the entries for the Royal Photographic Society's 95th annual exhibition was a photographic method of examining wear in precision bearings and some interesting radiographs of an avometer and a steel plate taken with 2 million volt X-rays. Also on view were some examples of the use of photomicrography in the examination of living tissues. One of three sub-standard colour films shown by the society is devoted to corrosion and heat-resisting steels.

Fluctuating Tin Prices

Prices of tin varied considerably during the week. On September 13 prices dropped by as much as £30 but rallied later. The net falls were then about £12 for spot and £6 for forward purchases and the price closed at £775. On September 15, after a weak opening, there was a rally, and business (in three months) was at £784. On September 18 prices on the London Metal Exchange fell about £26 a ton, though cash tin at £760 at the close, was £4 higher than at the end of the opening session.

OCCA Jubilee

The Manchester section of the Oil and Colour Chemists' Association celebrated its silver jubilee with a dinner and dance, held in Manchester on October 20.

Import Duty Exemption

Ferro-silico-chromium containing not less than 20 per cent of silicon and 10 per cent of chromium is exempted from import duty under the Import Duties (Exemptions) (No. 9) Order, which came into operation on September 21.

Electric Motor Prices Reduced

Increased volume of production and improved methods are credited with having enabled Newman Industries, Ltd., Yate, Bristol, to reduce home and export prices of some larger electric motors, in some instances by nearly 10 per cent.

Coal Output

Deep-mined coal production last week rose by 2000 tons, although the total output showed a slight decrease over the previous week. Comparative figures are:—Last week: 4,206,700 tons (deep-mined 3,972,600 tons, opencast 234,100 tons) Previous week: 4,208,200 tons (deep-mined 3,970,600 tons, opencast 237,500 tons).

Steel Production in August

Output of steel in August was at an annual rate of 14.53 million tons, which compares with a rate of 14.367 million tons in July. During the first eight months of 1950 the annual rate has been 16.063 million tons; the target set for the year is 15¾ to 16 million tons. Production of pig iron was at an annual rate of 9.205 million tons, against 9.099 million tons in the month of July.

Developing Refinery Programme

Work is now well in hand on the second distillation unit and the catalytic cracking plant of the new refinery at Stanlow which are due for completion next year, reports the *Shell Magazine*. At Shell Haven the cooling water pumphouse, which takes water from the Thames, will be finished in a few weeks' time, while work on the 6000 tons-per-day distillation unit is well advanced. The boiler plant, doctor treater and other facilities are nearing the completion stage, and refining operations are due to start in two months' time.

Company Meeting

THE DISTILLERS CO., LTD.

Good Progress in Home and Export Markets

THE 73rd annual general meeting of the company was held in the North British Station Hotel, Edinburgh, on Friday, September 15, 1950, when the chairman, Mr. H. J. Ross, presided.

The chairman said: As usual, I propose to preface my statement with a reference to changes in the constitution of the board which have taken place in the course of the past year, or which are immediately imminent. The report lists the names of three new directors who have been appointed since the last annual general meeting, and you will be asked to give your approval of these appointments later in these proceedings.

Apart from Mr. Connell, who retires by rotation but who does not seek re-election, two other directors—Mr. Adams and Mr. Comery—are due to retire from active business at the end of the present month in accordance with the provisions of the company's superannuation scheme.

You will observe from the report that these two gentlemen are to retain their directorships for a period, during which they will act in a consultative capacity. As this is a departure from the company's established practice, a word of explanation is necessary. I think it is generally known that the majority of the company's directors are wholetime working executives, and, as such, are due to retire at age 65 in terms of the superannuation scheme. It is felt that, with a life-time's experience of our activities behind them, they can still be of great value to the company, and the intention is to retain them as directors without executive duties for a period of three more years, during which time they will attend the regular meetings of the board.

Trading Profits

The statement of accounts discloses that the manufacturing and trading profits of the company and its subsidiaries for the year ended March 31, 1950, amounted to £12,887,691. This is a record for the company and compares with £10,861,857 for the previous year. To the profit is added income from investments and other sundry items, making a total revenue of £14,082,826. Taxation requires £6,421,948, and after making provisions for depreciation, writings off, and allowance for interest of outside shareholders of subsidiary companies, the net profit attributable to the group is £5,930,557 as against a corresponding figure in the previous year of £4,756,628.

The revenue reserves of subsidiary companies have been strengthened by the transfers thereto of £1,222,814 while the board has agreed to appropriate £512,923 to general revenue reserve in the books of the parent company. At the same time the directors agreed to appropriate £100,000 from the investment reserve and to use it in reducing the book values of certain investments in subsidiary companies.

The balance available is £4,294,820 and, after providing for the dividends distributed or recommended, the carry-forwards are increased by £1,742,955, making them £5,986,353.

Dividends

It may be noted that of the net profit attributable to the group—that is after taxation and all charges—42 per cent was earmarked to stockholders by way of dividends and 58 per cent was ploughed back into the business by way of reserves or increased amounts carried forward. In considering this policy the board had due regard to all relevant factors and particularly that of restraint in declaration of dividend and the necessity of conserving cash resources to meet commitments for capital expenditure, etc. On May 4, 1948, to save any misunderstanding, the board announced that 28 4/7 per cent was the standard by which a policy of dividend restraint should be measured. Since that date the issued capital has been increased and the equivalent rate works out at slightly over 19 per cent. For the year to March 31, 1949, the dividend rate based on the new capital was 18 1/3 per cent.

In all the circumstances the board decided that the correct course was to recommend a final dividend on the ordinary stock of 7 1/5d. per 4s. unit, which with the interim dividend already paid, made 9 3/5d. per unit for the year, equivalent to 20 per cent, all less income tax. The increase in the amount actually distributed is £206,606.

In view of the small increase granted to the ordinary stockholders, and to mark its

appreciation of the services of the works and office staffs in making possible the record level of profits, particularly from desirable export markets, the board decided to grant an export incentive bonus to all employees having six months' service in the group and in active employment at the date of payment. This will be at the rate of 2½ per cent of salary or annual equivalent of normal weekly wage and is additional to the monetary bonus of 7½ per cent previously granted to the staffs. The board believes that the stockholders will give full endorsement to this decision.

Production Costs

The profits of the group increased by nearly £2.5 million and it is desirable to make reference to two factors which played a part in this result. Firstly, in September, 1949, immediately following the announcement of devaluation of sterling, the company, in accordance with the Government's wishes, adjusted the sterling prices of Scotch whisky exports to the U.S.A., Canada and certain other markets. These adjusted prices brought additional revenue to the blending companies and are still in operation. It must be remembered, however, that, as an offset, costs of production and of selling have risen quite substantially. Secondly, the group received a satisfactory and encouraging return from part of the expansion scheme, although it will be some time yet before the full benefits are available.

The legal balance sheet of the company calls for the following comments:—

(1) The issued ordinary stock of the company shows the increase brought about by the capitalisation of £7,512,923 of the revenue reserves and the appropriation of this to the ordinary stockholders by the allotment of £1 of stock for every £2 held.

(2) Investments in subsidiary companies and trade investments both show substantial increases since the previous report, and these reflect further payments in connection with the expansion programme. As a consequence the net liquid assets of the company show a reduction.

In the consolidated balance sheet it will be noticed that the amount of fixed assets is higher by a little over £2.5 million due to the development of the expansion programme. Current assets also show a substantial increase, while current liabilities remain much the same as in the previous balance sheet. While the issue of new ordinary stock during the year required the capitalisation of £7,512,928 of available reserves, the total of reserves and surplus at March 31, 1950, at £29,063,463 is only £3,872,453 less than at the previous balance. Issued share capital and reserves are over £4 million higher, representing the increased strength of the organisation.

The board when agreeing to undertake the expansion programme gave very careful consideration to the eventual costs. Since then, however, factors have arisen to cause amendment to these figures. These are:—

(1) The costs of the programme are proving to be in excess of the estimates.

(2) As development has progressed certain additional and costly extensions have proved necessary.

(3) The additional working capital required to finance the holding of stocks at increased values and the replacement of plant and machinery.

(4) The essential allocations for taxation, particularly for profits tax, have been substantially above the estimated amounts taken into account.

In addition, it has now been agreed by the board to extend and to modernise the blending and bottling plants of certain of the large subsidiary companies.

As a consequence the company considered it advisable to make application to the Treasury for permission to borrow £10 million by way of unsecured loan stock for a limited period with repayment starting at an early date. The necessary consent has been granted.

It has been decided to borrow the money from certain corporate investors. The stock is divided into two serials. The first, £4 million 3½ per cent stock serial, issued at par, to be repaid by four annual instalments of £1 million starting in 1952 and finishing in 1955. The second, £6 million 3 15/16 per cent stock serial, issued at par, to be repaid in four annual instalments of £1 million starting in 1956, with a final one of £2 million in 1960. It is expected that the money will be available to the company on September 20, 1950.

Taxation

In connection with the increase in taxation to which reference has been made, it is appropriate to mention that in the past two years the total cost of taxation to the group has been a little under £12 million. Taxation at the present high level is causing considerable anxiety to those responsible for the carrying on of industry, as it is proving a severe drain on the resources of the companies concerned, reducing the amounts they have available for renewals of plant and machinery, the carrying of additional desirable stocks and the development of new projects.

As forecast to stockholders at the previous annual meeting a pension scheme has been established by an agreement and deed

of trust under which the company and certain of its subsidiaries will contribute sums to secure continued payment of pensions existing at April 1, 1950. These companies will also provide for payment in due course of pensions to present and future employees, their widows and dependants. This scheme has received the approval of the Inland Revenue authorities. It is satisfactory that the actuary to the scheme has reported that the superannuation and provident reserves of the group are in the aggregate more than sufficient to cover the amounts required at March 31, 1950.

During the year under review the company's malt and grain distilleries secured good outputs, and these enabled the blending companies to make very welcome additions to their stocks of maturing whiskies for use in the years to come.

For two successive years reference has been made to the very meagre allocation of Scotch whisky available to the home consumer, but on this occasion I am able to report some modest degree of improvement in this respect. Releases for the home market may be increased from 2 million to 2.6 million proof gallons. This relaxation on the part of the Ministry was accompanied, however, by a demand for a similar increase of 600,000 proof gallons in the volume of exports.

Home Trade

Under last year's arrangement with the Ministry of Food the releases for home trade consumption were pegged at 2 million proof gallons for the industry as a whole but the actual releases for that period were more than 50 per cent in excess of the prescribed figure, being in point of fact over 3 million proof gallons. A large part of these additional releases took the form of supplies of Scotch whisky which were only available to the trade and to the public at prices very substantially in excess of the prices at which our brands are sold. It is to be hoped that the permitted increase of 600.000 proof gallons for the current period will have the effect of reducing the demand for these highly priced supplies, and so in some degree regulate what has been a most unsatisfactory position.

At the same time, however, it must be pointed out that the prospect of reaching pre-war volume of sales in the home market is extremely remote so long as the present rate of duty continues.

During the year under review the demands for the group's brands in the United States of America and in Canada were well maintained, but business with certain South American countries continued very difficult. The board regrets that once again shipments to soft currency markets had to be curtailed.

In South Africa, good shipments were effected during the second half of the calendar year 1949. Since then importation of alcoholic beverages has been prohibited. It has now been announced, however, that permits will be granted to importers based on a percentage of their imports during the calendar year 1948. While the quantities for entry will prove quite inadequate to meet demands, it is satisfactory that this important market is opening up again to some extent to our products.

I am happy to report a satisfactory year's trading on the part of our gin companies. Sales show substantial increases in both home and export markets, which is at once a reflection of the popularity of our brands of gin with the public, and a tribute to their high standard of quality. Our American gin sales during the year under review constitute a record.

Molasses Prices

Production at the company's yeast factories continued at a high level, and reasonable profits were derived from this section. As will be explained later on, the price of molasses for delivery in the near future is uncertain, and it may well prove necessary, in course, to offset the anticipated rise in price of this main raw material by an increase in the price of yeast to the consumer.

I am glad to say that the year under review has been a very active and satisfactory one throughout the industrial branch of the company. Reflecting, no doubt, the general improvement in trading conditions in most industries, the demand for industrial alcohol and the chemical products which we manufacture has shown a substantial increase during the past year, including an expansion in our direct chemical export trade.

Raw Materials Purchasing

In my previous report, I stated that there appeared to be a prospect of securing forward supplies of molasses at reasonable prices, and we were fortunate in covering our requirements for a greater part of the current year. The further outlook, however, is much less favourable, due partly to the shortfall in the Cuban crop last season, coupled with the unexpectedly high demands for molasses from the U.S.A., and indeed, throughout the world. At the moment, the forward position is obscure. but there appears to be every likelihood of a substantial rise in the price of molasses. Our purchasing arrangements through the United Molasses Co., Ltd., will, we hope, safeguard our position as far as

it is possible in an admittedly difficult market.

The major expansion scheme at the Hull factory of British Industrial Solvents is now nearing completion. During the past few months, various sections of the programme have been successfully commissioned, and these are now making an important addition to the range of solvents, plasticisers and chemical intermediates produced at this factory.

The progress made in the petroleum chemicals project at Grangemouth, under the auspices of British Petroleum Chemicals, Ltd., in which we are associated with the Anglo-Iranian Oil Co., Ltd., is very well maintained. The operation of this plant will considerably strengthen our position in the supply of important chemical raw materials. Among other products to be produced at Grangemouth will be a large quantity of synthetic ethyl alcohol which will assist in alleviating the difficult molasses position previously referred to.

Styrene Monomer

Some months ago it was announced in the Press that it was proposed to erect a plant at Grangemouth to manufacture styrene monomer, mainly required as an intermediate for the manufacture of polystyrene, a plastic material for which there is a large potential demand in this country. A new company—Forth Chemicals, Ltd.—has been formed to carry through this development, the capital of which is held as to two-thirds by British Petroleum Chemicals, Ltd., and one-third by Monsanto Chemicals, Ltd. This project is part of our general plan to develop at Grangemouth the manufacture of derivatives from the new materials made available to us from the petroleum chemicals plant to which I have made earlier reference.

Our business in liquid and solid carbon dioxide has continued to expand during the year and has necessitated further extensions in hand, and planned, to our productive facilities. The unrivalled services which our subsidiary, Carbon Dioxide Co., Ltd., is able to offer from its many production points strategically located throughout the country, together with the high quality of its products, should ensure that we continue to obtain our share of this expanding trade.

Distaquaine

The penicillin factory at Speke, Liverpool, has again had a satisfactory year. The improvements and additions to the plant are practically complete and the present rate of production and sales is now more than two-and-a-half times the output last year. We have recently marketed two new forms of penicillin, Distaquaine (an aqueous suspension) and Distaquaine Fortified, both of which have been extremely well received by the medical profession, incorporating, as they do, improved methods for administering penicillin. Development work is continuing with results which it is hoped will enable the company to make further contributions to this field in the future.

There has been a marked recovery in the plastics industry generally, from which we have benefited. The full output of the British Geon polyvinyl chloride plant at Barry, South Wales, has proved insufficient to meet consumers' demands, and a 50 per cent increase in capacity will shortly commence production. The outstanding quality of Geon polyvinyl chloride is widely recognised and is opening up a constantly expanding field of application.

The British Resin Products factory at Barry is now complete and their operations at Feltham and Tonbridge have been transferred to Barry. The wide range of products made at this factory includes thermosetting and thermoplastic moulding powders; paint and varnish resins; resins for the impregnation of wood, paper and fabric; and synthetic adhesives. A recent addition is polystyrene, which should prove of value to our trading operations. We are now beginning to derive benefit from the centralisation of our plastics production in South Wales, which provides greater and improved facilities for production and for research and development.

Commonwealth Associates

Our associate companies in Australia and South Africa continue to make progress in their respective chemical fields, with satisfactory trading results.

The company's extensive research services continue to play an important part in the development programme in which we are now engaged. Although our research is primarily for this purpose, it is gratifying to record that a number of processes developed by our research department have attracted interest in various parts of the world, particularly the U.S.A., and the licensing of these will, it is hoped, make an increasing contribution to our revenue.

While it is not desirable under present world conditions to make any forecasts, it is satisfactory to report that, so far as the current year has gone, the profits earned by the company are in excess of the standard of the year to March 31, 1950.

Once again it is a pleasure to pay tribute to the staffs—both in works and offices—for their excellent work, their devotion and their loyalty throughout the past year.

The report was adopted.

The Stock and Chemical Markets

STOCK markets earlier in the week were uncertain, although active, pending the outcome of the vital Parliamentary steel debate. General Election uncertainties caused a reaction in British Funds, which later tended to rally. Industrial shares have been inclined to move higher in response to the prevailing view that most companies should be able to maintain their dividends for the current year. Iron and steel shares are below their scheduled takeover levels. The latter, and the exchange into steel stock, would mean a big loss of income for holders, even if the new steel stock carried interest of 3½ per cent. Rumours that the North Koreans may break off hostilities led to some sharp declines in commodity and metal prices. Tin, at the time of writing, has lost more than £30 at £760 per ton; rubber was more than 2d. easier at 3s. 10¾d. per lb.

Chemical and kindred shares generally have been firm, Imperial Chemical at 42s. 10½d., buyers coming in on general confidence that the 10 per cent dividend is likely to be maintained for the current year. Monsanto were 50s. 9d. and Albright & Wilson were up to 31s. 9d. in the belief that the company may be planning a closer collaboration with the Dow Chemical Company and the Corning Glassworks, in the U.S.A.

Brotherton 10s. shares remained at 20s. Laporte Chemicals 5s. units were 10s. 7½d., W. J. Bush 85s. 6d., Amber Chemical 2s. shares 2s. 9d., F. W. Berk 10s. 6d., Boake Roberts 30s. 3d., Pest Control 5s. shares 6s. 9d. and L. B. Holliday 4½ per cent preference 19s. 9d. Fisons strengthened to 26s. 9d. United Glass Bottle have been firm at 75s. and Triplex 10s. units remained active, although at 25s. 9d. they have not held their best prices.

Shares of plastics companies have become firmer, following the statement at the Distillers' annual meeting that conditions in the plastics industry have improved. De La Rue were 24s. 3d., Kleemann 10s. 3d. and British Xylonite moved up to 82s. 6d. The 4s. units of the Distillers Co. itself were good at 19s. 6d. on the chairman's statement that the uptrend in the group's profits is continuing in the current year, thanks partly to first benefits from the big expansion and development programme. The market is impressed by this and by the widespread chemical and industrial interests of the group. United Molasses have been active up to 46s. 9d., reacting to the higher price of molasses. Turner & Newall were firm at 88s. 9d. on higher dividend possibilities and there was again demand for British Glues, which were up to 22s., although now "ex" the bonus shares.

Glaxo Laboratories 10s. units were firm at 48s. 9d., Boots Drug 49s. 6d. and Borax Consolidated 54s. 6d. Among paints, Pinchin Johnson were higher at 42s. 6d. and Lewis Berger 29s. 4½d. Lever & Unilever firmed up further to 42s., helped by the Ministry of Food's decision to cease bulk buying of cocoa and hand over the market again to private enterprise.

Dunlop Rubber were 61s. 7½d., Beechams deferred firm at 14s. 7½d., General Refractories 22s. 10½d. In oil shares, Anglo-Iranian rallied strongly to 6 5/32, Shell were firm at 68s. 1½d., Canadian Eagles rose to 28s. 3d., and Ultramar, despite, the lower production figures, were slightly higher at 17s. 1½d.

Market Reports

A FIRM price position is recorded in most sections of the chemicals market, with a sustained demand from the chief home consuming industries. Export trade has again been on a good scale and inquiry for shipment is thought to cover a wider range of industrial chemicals. There is no special feature to report about the soda compounds, supplies of which appear to be adequate to meet the demand. Offers of potash chemicals are finding a ready outlet. The call for non-ferrous compounds remain steady, on the recent advance in quotations. There is a good request for bleaching powder, liquid chlorine and formaldehyde. In the coal tar products market there is a persistent demand for the light distillates and values throughout remain firm against a none too plentiful supply. Export trade is brisk with offers of ADF cresylic acid readily absorbed.

MANCHESTER.—Strong price conditions for heavy chemical products continue in almost all sections of the Manchester market. Delivery specifications for home-trade users are now circulating steadily. A substantial aggregate of new business in the soda compounds and other staple products has been placed during the past few days by the cotton textile mills and other industrial users. Export business has been pretty well maintained. Moderate buying interest

(continued at foot of next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BROOKS' DYE WORKS, LTD., Bristol. (M., 23/9/50). Aug. 17, charge, to Bristol Permanent Economic Building Society securing £3000 and any other money, etc.; charged on 179 Whiteladies Road, Bristol. *£41,783. June 10, 1949.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 23/9/50). Aug. 23, £1000 debs., part of a series already reg. *Nil. July 22, 1949.

PEACOCK & BUCHAN, LTD., Southampton, mfrs. of compositions for ships' bottoms etc. (M., 23/9/50). Aug. 10, £1000 deb., to Miss A. M. Buchan, Burley and others; general charge. *£2300. June 5, 1950.

PRINCE REGENT TAR CO., LTD., London, W.C. (M., 23/9/50). Aug. 16, deb., to Prudential Assurance Co., Ltd., securing £150,000 with premium not ex. 1 per cent payable in certain events; charged on properties at Diss, Hertford and Silvertown, with fixed plant, machinery, etc. *Nil. Jan. 13, 1950.

WHITE SAND & SILICA CO., LTD., London, E.C. (M.,23/9/50). Aug. 22, mort. and deb., to District Bank, Ltd.; charged on land and buildings known as Pentrefelin Works, Pentrefelin, Llantysilio; and a general charge. *Nil. Feb. 8, 1950.

Satisfactions

ADHESIVES (RADCLIFFE), LTD., mfrs. of adhesive substances. (M.S., 23/9/50). Satisfaction Aug. 23, of mort. reg. Feb. 10 1949.

MERRIGLO, LTD. (formerly MERRIGLO (PLASTICS), LTD.), London, W. (M.S., 23/9/50). Satisfaction Aug. 18, of deb. reg. Nov. 11, 1949.

PALSCO, LTD., Biggleswade, chemists. (M.S., 23/9/50). Satisfaction Aug. 22, of mort. reg. May 29, 1946.

PILKINGTON BROTHERS, LTD., Liverpool, glass mfrs. (M.S., 23/9/50). Satisfaction Aug. 17, of deb. stock reg. Nov. 13, 1947, to the extent of £2500.

Company News

Albright & Wilson, Ltd.

An interim dividend of 10 per cent on the ordinary stock, less tax, has been declared by Albright & Wilson for the year ending December 31, 1950, payable on September 30.

The Distillers Co., Ltd.

A dividend on the preference stock of the Distillers Co., Ltd., for the six months ended September 30 has been declared at the rate of 3 per cent, less income tax, payable on November 15, to stockholders on the register at September 15.

Metal Industries, Ltd.

Gross trading profits and investment income of Metal Industries, Ltd., group totalled £1,058,548, including the profit of the new subsidiary, Cox & Danks, Ltd., for ten months, against a total last year of £996,254. Dividend of 10 per cent on the ordinary stock has been declared.

Powell, Duffryn, Ltd.

Powell Duffryn, Ltd., is maintaining at 8 per cent its distribution on the ordinary stock for the year ended March 31, with a final dividend of 5 per cent, payable on October 31. The consolidated net profit for the year amounted to £647,073, compared with the previous year's £652,106.

Sangers, Ltd.

Trading profits of the Sangers group for the year ended February 28 increased by £74,650 to £460,319, compared with the previous year. Dividend on the ordinary stock is maintained at 30 per cent.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

is being shown in fertilisers, with a fair trade passing in the by-products.

GLASGOW.—There has been a slight lull in the Scottish heavy chemical market this week, owing to the continually changing and advancing prices. The possibility of controls is stated in some quarters to be having a depressing effect. Exports are getting more and more difficult owing to heavy home demands.

New Source of Data for Radiochemists

A VALUABLE tool for nuclear physicists, radiochemists, and other workers in the rapidly expanding field of nuclear physics is now available in the tables of *Nuclear Data* recently compiled by the U.S. National Bureau of Standards. These tables, which may be obtained from the U.S. Government Printing Office, are to be followed by supplements of new material at six-monthly intervals.

The initial volume of the tables, together with the supplements, will present a comprehensive collection of experimental values of half-lives, radiation energies, relative isotopic abundances, nuclear moments, and cross sections. Decay schemes and level diagrams, over 125 of which are included in the tables now ready, are to be provided wherever possible. At present over 1000 new measurements of different nuclear properties are being reported each year in some 80 different journals and in the reports of many different laboratories.

The National Bureau of Standards will have the assistance of the Oak Ridge National Laboratory, the Brookhaven National Laboratory, the Massachusetts Institute of Technology, and the University of California Radiation Laboratory in making the first effort to present continuous and accurate information in this rapidly developing field. The present tables and the supplements to follow are therefore designed for easy assimilation of new material in loose-leaf form.

All the more recent values of a given nuclear property are listed in the tables, and thus, from the degree of uniformity of the results, the reader can tell at a glance the degree of certainty of the tabulated nuclear constants. References to over 2000 original papers make it possible for the research worker to evaluate the details of previous investigations and to design experiments to resolve existing discrepancies.

Circular 499. *Nuclear Data*, of 310 pages, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price $4.25 a copy includes the cost of three supplements to be supplied at six-monthly intervals. The cost in this country is increased by one-third to cover postage.

The Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Afterthoughts on Nationalisation

THE complexity and the diversity of methods and services of the widespread network comprising chemical industries have baffled most attempts by experts to provide a short, valid definition of the main divisions of industrial chemistry. The magnitude of all these interests is certainly not wholly reflected in the total of £230 million capital investment referred to in the Report on Chemical Industry, which the Association of British Chemical Manufacturers presented to the President of the Board of Trade at the beginning of the year. That review was intended perhaps to serve as a relatively small cross-sectional view permitting some deductions to be drawn about the whole. It is revealing, and to some perhaps alarming, to observe the indifference to considerations such as this which characterise the kind of proposal with which some trade union officials have made us familiar for making chemical industries another State operated group.

Some inkling of the lack of realism in the grandiose proposals which have been made in the past appears to have conditioned the newest version of the same theme, which was offered to a section of workers in chemical industry at the general meeting in Harrogate last week end of the Chemical Workers' Union. According to this manifesto, this union which shares with several others the representation of organised chemical workers, is still "in favour of the nationalisation of the entire chemical industry but has modified its view to meet the desires of the Labour movement for limited nationalisation."

It appears that the propounders of this policy would be satisfied, for the time being, with something less than the equivalent of the Iron and Steel Act. It asks now that the Government should stretch the powers it has acquired to "extend Government activities into the coal by-product industries . . . to take over the coal tar by-product industries . . . and to establish centres of production for the manufacture of a number of pharmaceutical products and drugs which are in constant demand, arising from the application of the National Health Act." The Chemical Workers' Union itself does not appear to have been invited to express its approval or opposition, since no mention of the proposals is made in any of the 15 resolutions put to the Harrogate meeting.

Perhaps the best claim to attention of the proposals made, almost incidentally, at the Harrogate meeting is the light which they throw on the practical im-

On Other Pages

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possibility of procuring anything that could honestly be described as " a mandate " to usurp the functions of management of an industry. The conspicuous fact about this chemical manifesto is that control by a Government board, which is generally what nationalisation involves, appeals about as little to those who agitate for nationalisation as it would to those who condemn out of hand the effect of substituting bureaucracy for business management.

The general secretary of the C.W.U., in a booklet distributed at Harrogate purporting to show why " the chemical industry " should be nationalised and how to do it, presents a point of view which bears so close a likeness to the opposition case that it is difficult to credit that the respective spokesmen are diametrically opposed. Whatever workers in chemical industries feel, the trade union secretary is in no doubt that the mixture already prescribed for some other industries would produce something like paralysis if it were administered to the chemical enterprises. Although it appears to represent the general secretary's own view, which others may or may not share, this verdict on nationalisation deserves recording:—

" The Labour Government seems so far to have failed in thinking out the precise methods of application of an essentially socialist organisation . . . If any intelligent worker employed by one of these existing forms of public ownership " (the BBC, BOAC and others are instanced) " is asked his opinion, invariably those most energetic and imbued with a keen sense of public responsibility will sum up in one word, ' frustration.' "

That, the trade union commentator concludes, is the price which a bureaucracy exacts because Labour Ministers lack understanding of the principles of management and the senior Civil Servants to whom they turn " have no ready fund of experience on which to draw for administration in this vastly different field of industry and commerce."

By a process of reasoning which pays little regard to logic, the obvious conclusion—that the only people qualified to manage chemical industries are those who have been doing it manifestly successfully all their lives—is, of course, not the one to which this kind of argument leads. The answer is indeed much too involved to be summarised, except by saying that it requires " an industrial democracy," decentralisation, producer and consumer councils and, at the top, a policy-making national council sitting in public as " a miniature parliament." Chemical workers may understandably wonder whether their aspirations will influence this miniature parliament any more readily than they have the one in Westminster.

Notes and Comments

An August Trade Record

THE scale of the increases of export shipments of chemicals in August, to make up a total of £9,248,922, constitutes a change for which it would be hard to find a parallel since the war's end. An increase of more than £2.6 million in one month—taking August 1949 as the standard of comparison—cannot be entirely dissociated from widespread anxiety less the peacetime basis of exchange should be demolished by some decisive act of aggression, and the expectation that the British rearmament programme might make inroads upon a good many chemical products earmarked for the export market. If those are in fact the main forces behind this phenomenal upward surge in chemical sales the readiness of practically every buying country to forestall events is almost as arresting as the effect on the total. A list, by countries, of export sales of chemicals of all kinds, including drugs, dyestuffs, colours and so on, reveals that almost every large buyer has taken substantially increased shipments than were required in August last year. Should this sudden rise in demand for British chemicals not be long maintained at the present record level there will still be grounds for solid satisfaction in the windfall in American currencies and the absence of any evidence that the home trade has been deprived. The American accounts for August 1949 and August 1950 show, for example, totals like these: U.S.A., £60,400 : £480,143; Canada, £126,792 : £314,285; Colombia, £6385 : £56,443; and Mexico, £8859 : £33,104. Ability to continue to serve the world and home users on such a scale would dispose of any doubt about the progress of "productivity" in basic chemicals.

Revealing Comparisons

THE exceptionally large share borne by chemical products, in relation to normal commodity ratios, in narrowing the dollar deficiency will not have passed unnoticed by American chemical industries. Their expressions of concern earlier this year, mild as they were, will seem to have little relation to the facts to any one who pauses to contrast the sum of our chemical exports with the vast and growing total of American chemical production. An impressive, if circuitous, method of relating August's record total exports of U.K. chemicals with America's capacity as a purchaser is suggested by one of the things said in Glasgow last week by the American Consul-General, Mr. Dayle C. McDonough. Applauding the recent increases in shipments to the U.S.A. of products such as iron and steel manufactures, machinery and cresylic acid—which, as Sir Cecil Weir, chief of the Dollar Export Board, disclosed on Tuesday, have helped to halve the dollar gap—the U.S. Consul-General gave a revealing comparison. British exports of all kinds to the U.S.A. are equivalent to about 11 per cent of the total sales of one leading American mail order concern—Sears Roebuck & Company. Similar comparisons can be multiplied: chemicals accounted for only about 1.5 per cent of the record total to the U.S.A. in August. It would not seriously have upset the accountancy of one of those giant American retail organisations, much less the total of American chemical output. The scale of that may be judged from the fact that its export surpluses alone produced $182 million in three months this year.

Concessions to Western Germany

ONE of the most suggestive results of the "liberalisation of trade" agreements and the recent ratification of the European Payments Union agreement is the freedom to be accorded to Western German industries in the U.K. markets, as from Tuesday this week. These concessions permit the import without individual licence of a wide range of goods from most OEEC and many other soft-currency

countries. At present there exists no separate schedule of chemicals or scientific instruments to be imported without restriction from Western Germany, but the extension of the concessions there clearly opens up the possibility of considerably increased competition from German industries. British interests are well advised in watching very closely what emerges from this new facility for Germany to widen the field of low-price commercial policy. All the European markets of the 18 countries concerned will now be wide open to the Germans, as they have frequently been to other producers who have been able to undercut Britain. The influence of import quotas was in the past the principal safeguard against the price-cutting policies of countries in which labour was cheap or production costs were indirectly subsidised. One expert view expressed this week affirms that Germany " will undoubtedly get going " in pressing sales of commodities such as glass and scientific instruments. Much will depend upon just how much control in the German economy is retained by the Allies. All recent indications are that that will soon be a negligible quantity.

Revaluing the Chemical Engineer

THE suitability of chemists and chemical engineers for what are called executive positions—a well-worn theme—gained a new lease of life at the recent corporate meeting of the American Institute of Chemical Engineers. The American fraternity rather naturally had no doubts that the chemical engineer, at least, has an essential rôle to play in directing, and not merely facilitating, industrial processes and the growth of industries. A testimonial of that was given by Mr. L. A. Hatch, vice-president in charge of research of the Minnesota Mining & Manufacturing Company, who affirmed that the training and background of chemical engineers made their guidance invaluable to financial interests and their skill was the means of creating new jobs and new and better products at low prices through the efficient application of technology. The habit of leaving the chemical engineer outside the board room is considered to be losing ground in the U.S.A. Mr. L. P. Scoville, production manager of the Jefferson Chemical Company, who confirmed this at the Minneapolis meeting, believed that the fuller recognition of the chemical engineer lies in the immediate future. He made the interesting point: "Chemical engineering is such a new profession that only recently have there been chemical engineers of sufficient age and experience to qualify for top executive positions." American industry is being taught that the growing ranks of chemical engineers, whose increase is unfortunately much more marked there than in this country, may have a surprisingly profitable influence if they are not treated merely as a new recruitment of good technologists.

Good Prospects for Plastics

THE dependence of the plastics industry on the availability of raw materials, and the need for a continued policy of long-term research, were the keynotes of the advice given by the chairman, Dr. R. G. Heyes, at the meeting in London this week opening the new session of the Plastics Institute. Dr. Heyes, considering the relationship between chemical industry and plastics, indicates that the latter may look for great benefits in the near future from the vast capital at present being expended by the oil industry on its cracking plants. The plastics industry, however, could not survive without expert teams of scientists working in collaboration—the chemist, physicist, chemical engineer and technologist. All are essential. Chemical industry now can make a material to suit almost any requirements, but mechanical methods of manipulation must keep pace. It is up to the chemical engineer to supply the plant, and to the plastics manufacturer and plastics fabricator to understand each other's problems.

Petrol Prices

Shell-Mex and B.P., Ltd. have announced an increase of ½d. per gal. in the prices of motor spirit and industrial spirits, with effect from September 22.

FELT INDUSTRY RESEARCH

Full Equipment for Fundamental Study Programme

THE new premises of the British Hat and Allied Feltmakers' Research Association at Stanley House, Fairfield, near Manchester, were officially opened on September 19 by Lord Derby. The association was formed in 1947 for carrying out fundamental and applied research on behalf of the hat and allied feltmaking industries and ancillary trades, and its membership includes wool and fur felt hat manufacturers, fur cutters, and manufacturers of ribbons, dyestuffs and machinery.

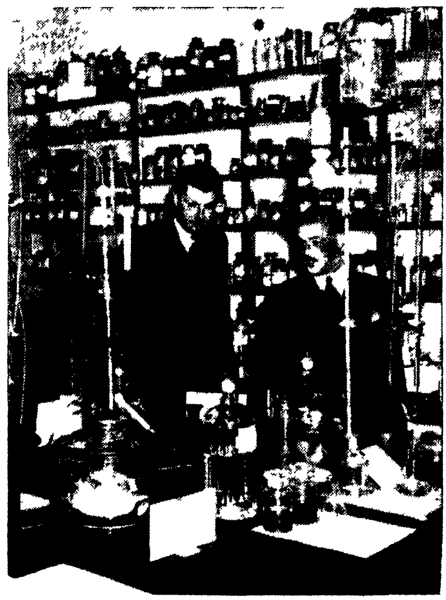
Stanley House, bought for £2280, and converted at a cost of £10,000, comprises laboratories for physics and chemistry and an information section, devoted to fundamental and applied research concerning raw materials, felt manufacture, and new developments in the use of felt. The staff includes eight qualified scientific and technical workers, six assistants and four clerical and administrative workers. The director of research is Dr. T. Barr.

The main chemistry laboratory is equipped with fixed sectional work benches and side benches for special apparatus.

When particular atmospheric conditions are required, the experiments may be conducted in the testing laboratory.

The work is financed jointly by the industry and the Department of Scientific and Industrial Research.

Dr. T. Barr told the Press at a conference prior to the opening that in its fundamental research work, the association hopes to find answers to some of the problems concerning the mechanism of felting and at the same time contribute to the sum of knowledge on animal fibres. This research, carried on without regard to immediate requirements, would form a fund of knowledge which would help in solving various problems met by the industry.



Part of the chemistry laboratory. With the director of research (right) is Lord Derby

Sulphuric acid was largely used in the industry but in addition there was the problem which was being considered of chlorinated noils from the wool industry which, if they were allowed to pass through undetected, caused endless trouble because of their inability to felt. This was another problem for research.

Steel Display Cancelled

BECAUSE of the prospect of nationalisation of the industry, the British Steel Federation has cancelled the space reserved for it at the Berlin International Industrial Exhibition which opens to-morrow (October 1). The British pavilion was planned as a composite display of 10 windows. Efforts are being made to fill the vacant site with some other form of British industrial display. Among the British products on view elsewhere will be leather, cotton and wool goods, glass, pottery, books, etc.

Gas Strike Halts Production

INTERRUPTION of output and considerable losses by non-ferrous metal producers and fabricators in the London area are among the effects produced this week by the progressive reduction of gas supplies caused by the continued strike of some 1500 gas industry engineers. A telegram to the Prime Minister by Mr. N. D. Robertson, managing director of the Non-Ferrous Die Casting Company, in North London, recorded that 31 of the 48 gas furnaces operated there were out of action and the firm might have to close down.

CHEMICAL EXPORTS AGAIN EXCEED £9M.

Large Increases in Ammonium and Sodium Compounds

THE high level of exports secured by British chemical industries in July was well maintained in August. The total value, including drugs, dyes and colours, amounted to **£9,248,922**, compared with **£6,594,864** (1949) and **£9,319,269** in August.

Outstanding values were: ammonium sulphate **£645,253** (£298,614); ammonium nitrate **£103,281** (£48,930); all other ammonium compounds **£80,297** (£49,868); sodium carbonate **£270,848** (£92,611); caustic soda **£417,070** (£201,108); bleaching powder **£30,965** (£8,737); copper sulphate **£219,294** (£103,047); tar oil, creosote oil, anthracene, etc. **£193,783** (£79,676).

Non-ferrous metals exports were valued at **£9,165,327**, compared with **£4,649,865** in August, 1949, mainly because of the increase in tin exports, which totalled **£2,337,686** as against **£86,990**.

	August, 1950	August, 1949
	Gal.	Gal.
Cresylic acid	276,255	107,833
	Lb.	Lb.
Salicylic acid	98,819	180,466
Value of all other sorts of acid	£157,639	£122,709
	Tons	Tons
Sulphate of alumina	2,849	3,390
All other sorts of aluminium compounds	554	551
Ammonium sulphate	32,995	15,707
Ammonium nitrate	3,743	1,740
All other sorts of ammonium compounds	2,176	1,336
	Cwt.	Cwt.
Bleaching powder	28,334	8,373
All other bleaching materials	12,321	10,299
Collodion cotton	1,578	1,920
	Tons	Tons
Copper sulphate	4,217	2,442
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	53,909	43,786
	Tons	Tons
Fertilisers	2,159	1,072
Value of gases (compressed, liquefied or solidified)	£35,545	£26,357
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	10,268	4,981
	Gal.	Gal.
Tetra-ethyl lead	100,141	76,436
	Tons	Tons
Magnesium compounds	876	601
	Cwt.	Cwt.
Nickel salts	6,378	5,779
Potassium compounds	6,962	6,033
	Tons	Tons
Salt	24,812	21,053
	Cwt.	Cwt.
Sodium carbonate	514,543	170,453
Caustic soda	353,239	187,467
Sodium silicate	20,091	15,008
Sodium sulphate	72,007	47,783
All other sodium compounds	97,877	78,116
	Gal.	Gal.
Tar oil, creosote oil, anthracene oil, etc.	3,612,009	1,917,935
	Tons	Tons
Zinc oxide	1,170	991
Total value of chemical manufactures (excluding drugs and dyestuffs)	£5,463,330	£3,317,883

	August, 1950	August, 1949
Value of quinine and quinine salts	£23,886	£36,564
	Lb.	Lb.
Acetyl-salicyclic acid	230,028	63,594
	100 International Units	100 International Units
Insulin	1,404,986	2,199,070
	Mega Units	Mega Units
Penicillin	1,319,995	697,546
Total value of drugs, medicines, and preparations	£1,840,402	£1,521,733
Total value of dyes and dyestuffs	£724,901	£867,242
Total value of paints, pigments, and colours	£1,220,289	£888,006
Total value of chemicals, drugs, dyes and colours	£9,248,922	£6,594,864
Total value of all plastic materials	£792,235	£456,497
	Cwt.	Cwt.
Chemical glassware	1,101	1,086
Value	£42,248	£52,462
	Cwt.	Cwt.
Fans	5,711	3,786
Value	£147,503	£101,365
	Cwt.	Cwt.
Furnace plant	15,366	3,742
Value	£166,197	£58,847
	Cwt.	Cwt.
Gas and chemical machinery	19,486	26,350
Value	£204,255	£273,257
Scientific instruments: optical	£91,143	£83,932
Value		
Thermometers, mercury in glass instruments, etc.	£42,439	£37,220
	Cwt.	Cwt.
Air and gas compressors and exhausters	17,642	10,774
Value	£359,293	£228,418
Non-Ferrous Metals	Cwt.	Cwt.
Aluminium and aluminium alloys	102,375	103,028
Value	£1,198,014	£1,217,301
	Lb.	Lb.
Bismuth metal (not including alloys)	58,374	76,506
Value	£39,940	£39,385
	Cwt.	Cwt.
Brass and other alloys of copper, other than nickel alloys	74,912	92,336
Value	£933,768	£858,137
	Tons	Tons
Copper	9,484	8,408
Value	£1,935,940	£1,271,834
	Tons	Tons
Lead, unwrought, sheets, etc.	6	13
Value	£775	£1,360
	Cwt.	Cwt.
Nickel and manufactures of	20,923	16,867
Value	£447,218	£254,568
	Cwt.	Cwt.
Nickel alloys	7,331	5,022
Value	£207,061	£109,951
	Tons	Tons
Tin unwrought	3,362	157
Value	£2,337,686	£86,990
	Lb.	Lb.
Tungsten (except ferro-tungsten)	22,911	25,107
Value	£22,618	£32,425
	Tons	Tons
Zinc	422	354
Value	£81,385	£50,301
Total value of group	£9,165,327	£4,649,865

MECHANISATION IN METAL INDUSTRY

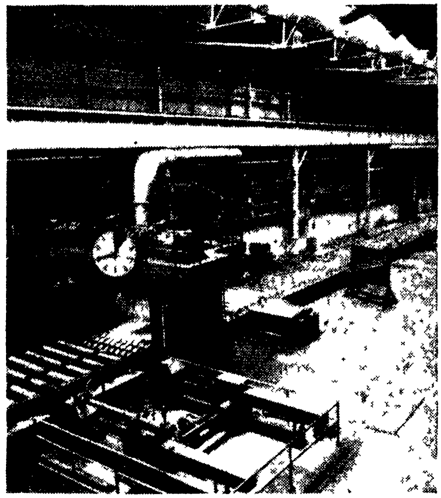
High Output of the New Aluminium Mill

THE installation described as the most efficient continuous type mill engaged in the rolling of aluminium outside the U.S.A. was inaugurated last week by the Minister of Supply (Mr. G. R. Strauss), at Rogerstone, Monmouth. It had just been brought into production by the Northern Aluminium Co., Ltd.

An increase of 35 per cent in the country's aluminium sheet rolling capacity is expected to result from the operation of this plant, whose output capacity is 50,000 tons of sheet and strip aluminium per annum.

The mill, erected at a cost of about £3.5 million, can be operated at speeds more than four times as fast as those of other systems, it is claimed. This will be the main source of the five-fold increase in production which it is expected to achieve without a corresponding increase in labour requirements.

The decision of the Northern Aluminium Company to build this extension to its Rogerstone works—which was then believed to be the largest aluminium fabricating unit in Great Britain—was governed by two main factors. The transition from the abnormal demands of war-time production to the more competitive conditions made it evident that to maintain the advances of the past few years in the aluminium industry, and at the same time establish new markets, would require a new approach to the cutting of production costs. This has, apparently, been done by the use of the most up-to-date equipment and production methods.



Photographs by courtesy of The Northern Aluminium Co, Ltd.

Part of the hot line, one-third of a mile long; in the foreground is the breaking-down mill

The chief products of the mill are container sheet, corrugated sheet and building sheets of all kinds. The firm thus aims to introduce aluminium into fields where it has not up to the present been used on a large scale. Aluminium foil insulation—expensive, but economical—has been used in the works buildings to keep them cool in summer and warm in winter. By this method the thermal requirements for space-heating plant are stated to have been reduced by one-third, and the saving in capital cost of the heating plant will, it is estimated, pay for about 60 per cent of the cost of insulation. The production layout includes the hot-rolling line, extending nearly a third of a mile, where ingots weighing nearly two tons are heated to 400°-500° C.; high-speed cold-rolling mill, from which strips are ejected at speeds up to 2000 ft. a minute; reversing mill; trimming, cooling and coiling machines, and finishing equipment.

General view of hot finishing mill with two 4-high stands in tandem

Safety Programmes in Chemical Plants

Means of Economy in Insurance Charges

THAT it pays dividends, in effect, to develop as highly as possible accident prevention methods in chemical and other industrial plants—in addition to the even stronger recommendations—is demonstrated by the procedure adopted by the industrial insurance companies in this country in assessing premiums for certain risks in particular establishments.

The assessment of these premiums generally is based on the principle that they will be lightened in recognition of a diminution of risk rather than because of a reduction of the number of accidents.

This contrasts with the practice in the U.S.A., where insurance is a very complex business and entirely competitive. The circumstances surrounding the granting of a premium rebate of more than £30,000 to an American chemical manufacturing concern (THE CHEMICAL AGE, 53, 425) have no parallel in this country.

Here, an insurance company's expert surveyor visits a particular plant, prior to issuing insurance against accident risks, and the premium is fixed on what he reports having found there. Such reports are concerned very largely with the potential risks involved in particular processes, and in some cases the storage of dangerous materials. Particular importance is attached to the measures employed to combat those risks.

Adjustment of Premiums

Although insurance procedure in Britain is non-competitive, companies generally adopting the same methods of assessment and frequently arriving at identical results, there is no such thing, in practice, as a flat rate for a particular risk, and none of the bigger companies gives a "no claims" bonus on this class of business. It is understood, however, that one or two of the smaller insurance companies do effect "accident cover" on the principle of a plant's claims being consistantly below a ertain figure, but this is by no means a general practice.

The reverse aspect of this subject was provided, in recent years, by one chemical firm, which had had a comparatively large number of accidents of varying severity since its insurance was first effected. Its original premium was increased by the broker concerned. This, however, can happen only very infrequently, in view of the thorough and expert surveying of a plant's risk by the insurance company.

The closely related fire hazard is handled here by two classes of companies—"tariff" and "non-tariff." The former fix their premiums on the report of their surveyor on apparent risks and prevention methods practised. The non-tariff companies drive the best bargain—or "make the best risk"—they can, but the result is usually very nearly the same.

Payment of accident claims for personal loss and injury is nowadays effected through the working of the National Health Insurance Act, in instances in which no fault can be assigned either to an individual or a firm, the Workman's Compensation Act having been virtually dead for two years. In other cases, it is open to the victim of an accident to take common law action against the employers.

European Chemicals Proposal

THE national executive committee of the Chemical Workers' Union was the sponsor of a resolution approved at the annual conference of the union at Harrogate last week calling for "the co-ordination of European chemical industries in the interests of world peace and full employment." It urged that the Government should promote a conference in London "for the establishment of a Chemical House of Europe." Among the 17 objectives of such a conference, it is suggested, would be the co ordination of these activities in Europe:—

Research relating to atomics, chemicals, pharmaceuticals, biological questions, and medicines; marketing; exchange of teachers and research workers; exchange of surplus outputs; price stabilisation; European patent licensing system; exchange of information; progressive reduction of duties and tariffs; the exchange of basic products such as carbide, petroleum, salt, sulphur and coke; the establishment in the U.S.A. of European Houses of Chemicals to organise sales in the dollar area.

Methanol Mishap

No danger was offered, it was reported on September 22, from the 2500 gal. of methanol which spilled from an overturned road tanker at Acton Bridge, Cheshire, on the previous day. Cheshire County firemen "broke up" the spirit with water, with which methanol is miscible.

EFFICIENT USE OF COAL

Methods to Defeat Smoke-Fog Hazards

AN authoritative survey by Dr. D. T. A. Townend of the new scientific study of coal and its uses formed the starting point of the annual conference in Margate (September 27-29) of the National Smoke Abatement Society. His paper "Towards the Better Use of Coal." was the first of a new series of annual Des Voeux Memorial Lectures, inaugurated to honour the society's first president, Dr. H. A. Des Voeux.

Dr. Townend recalled that the scientific study of coal was a quite recent development, and he outlined how an understanding of coal's complex structure was being sought by the analyst, the geologist, and the physical chemist. He described how Dr. Seyler, now in his 80's but still active at the research laboratories at Leatherhead of the British Coal Utilisation Research Association, had discovered in coal nine different components, and how he had devised a technique for measuring the different proportions of each in different samples of coal, thus enabling coals to be identified and classified.

The work of the physical chemist in the study of the highly complicated internal structure of coal was described: work which has important bearings on practical problems of combustion and the use of different kinds of coal for different purposes. Dr. Townend gave a description of the intricate changes that take place when coal is burned, noting that it had recently been found that less smoke was formed if inert gases, such as nitrogen and carbon dioxide, were passed through the fire. These gases are present in the flue gases, and a reduction in smoke is observed when they are recirculated with the air supply to the fuel bed of the fire.

Down-jet Combustion

Progress in the development of the new down-jet principle of combustion was described. In this, instead of air for combustion flowing up through a relatively thin fire, it is forced down, as a jet, at an angle on to the surface of a much deeper mass of fuel. While further industrial development of this principle is necessary, there are already a number of units burning coke that have been successfully installed in industry.

A relatively new and important development, Dr. Townend considered, was concerned with the efficient use of small coal as source of energy for gas turbines. Experimental work on this is in progress, in which the British Coal Utilisation Research Association was collaborating with the Fuel Research Station of the Department of Scientific and Industrial Research.

Dr. Townend showed how smoke from coal was being reduced by improvements in practice and technology, and by the wider and more rapid application of science to fuel problems. The nationalisation of the great fuel industries, coal, gas and electricity, was an important factor, for although in the past these industries included many units with high standards of technical efficiency, the opportunity for those standards to become general was not great. "Organisation of these industries on a national basis," said Dr. Townend, "should enhance the prospect of lower technical standards being raised and of the whole of each industry becoming more rapidly responsive to new technical and scientific advances."

Small Expenditure on Research

Commenting on the smallness of the nation's expenditure on coal research—£1 million a year, or 1¼d. per ton of coal—Dr. Townend pointed out that this is roughly equivalent to the aggregate cost of one cigarette every four months per head of the adult population. "This position calls for serious thought" he said, "particularly in view of the importance of coal research in all its aspects to our present internal economy."

Medical Aspects

The conference heard several expert contributions discussing the domestic aspects of coal burning and the objectives which were to be pursued in the "new towns." The aspect of smoke-fog and lung diseases was then discused by Dr. J. S. G. Burnett, Medical Officer of Health for Preston, who mentioned serious incidence of deaths by smoke-fog poisoning and also examined cases of increased mortality in this country following smoke-fogs, citing examples from Glasgow and London.

It is clear, said Dr. Burnett, that the acute respiratory distress caused during smoke-fog is a general reaction to irritation, varying with the amount of irritant present in the air, the duration of exposure, and the previous physical condition of affected persons. "Hence severe distress may be caused and death among those already suffering from chronic cardio-respirator disease." Dr. Burnett then

went on to point out that between the extremes of complete recovery and death there are sufferers left with a residual defect that must make them less able to withstand subsequent attacks on the respiratory system. Because resistance varies so much from person to person there is no intensity of pollution below which it can be said that no harm would be done, and the only solution to the problem lies in the continuous application to measures to eliminate atmospheric pollution as far as possible.

Apart from the smoke-fog effects described by Dr. Burnett, which have a limited duration, there is always some pollution present in the air which may have some effects over a long period. Since some of the finer particles inhaled are retained in the lungs, their effect might well be cumulative.

Cumulative Effect of Smoke

This was stressed in the second paper of the health session, by Mr. R. E. Waller, of the Department of Pathology at St. Bartholomew's Hospital. He referred to the increase in deaths from cancer of the lung in recent years, especially in the towns, and to the conclusion reached by Dr. P. Stocks, of the General Register Office, that either smokiness of the air is an important factor in producing cancer of the lung, or sunshine (reduced by smoke) is an important factor in preventing it.

Examination of samples of town smoke has shown that some substances known to have carcinogenic properties are in fact always present in trace amounts. Arsenic is one, 3:4-benzpyrene another and radioactive material a third. Arsenic is present in some coals, and part of it is emitted with the smoke. 3:4-benzpyrene is a well-known constituent of coal-tar and some lubricating oils, and occurs in domestic soot (Goulden and Tipler, 1949). It has also been detected in the small amount of smoke emitted under certain conditions from the exhausts of internal combustion engines.

Radon Decay Products

The traces of radioactive material normally found in the atmosphere consist of the short-lived decay products of radon, derived from natural sources in the ground. While the origin of these has nothing to do with smoke, they do attach themselves to smoke particles in the atmosphere. The carcinogenic action of such material has not been directly established, but its possible effect should not be overlooked

Daily smoke filters, as run by some local authorities, provide suitable measurement, and are taken for analysis in batches of one month or more. The tarry matter in the smoke deposited upon them is extracted with acetone, and the complex mixture of hydrocarbons thus obtained separated as far as possible by chromatography. A solution is finally obtained containing a few micrograms of benzpyrene, together with some impurities difficult to remove. The benzpyrene is detected by means of its fluorescent spectrum, and its amount estimated by comparison with a standard. From the data supplied by the collecting authority, the total volume of air from which that amount has been drawn, and an estimate of the weight of smoke collected, are known. Hence the concentration of benzpyrene in the air, and its proportion by weight in the smoke collected can be calculated.

During a fog, the same atmospheric contaminants are still being emitted at the same rate, and accumulate at a low level. An example of the effect of this on benzpyrene concentration is shown in the results quoted in the table. The month cited showed a rather high average smoke concentration, and included three consecutive days of fog, referred to as Z-days (smoke conc. 1.25 mg./m^3), the papers from which were selected for separate estimation.

Benzpyrene in smoke Station B.

	February, 1949			February, 1950
Period	3 Z days	25 other days	All 28 days	All 28 days
Smoke conc mg/m^3	1 73	0 40	0 55	0 44
Benzpyrene conc mg/100 m^3	32 8	7 2	9 8	6 4
Benzpyrene in smoke p p m	190	180	180	150

Effect of Weather Fluctuations

The average benzpyrene concentration during the three Z days rose to over four times that during the remaining twenty-five, giving a whole month average 36 per cent higher than the latter, and 53 per cent above that for the corresponding month in the following year.

This illustrates the way in which certain weather conditions may cause irregular variations in the benzpyrene concentration from month to month, or year to year. The result that the proportion of benzpyrene in the smoke rose but little during the three Z days as compared with the rest of the month shows that the fog produces a change in quantity rather than quality of the suspended matter.

Whether or not the amount of benzpyrene reaching the lung is substantially raised during fog is another matter, as the particle size distribution is likely to be different under such conditions.

FURAN RESINS

High Resistance to Corrosive Action

BECAUSE of their good resistance to acids, alkalis and solvents, newly developed furan resins are finding increasing application, mixed with suitable fillers and setting agents, for making acid-proof mortar for acid-proof brick and tile installations. The U.S.A. at present leads in this sphere. This resin is the ideal cement for use in the installation of acid-proof brick floors, which are often subjected to strong alkali cleaners. It is also used for sewers, drains and masonry linings in industrial equipment which alternately handles strong acids and alkalis. Furan resin cement is suitable for acid recovery systems, chlorinators, digestors, dye vats, neutralising tanks, pump bases, receivers, and so on.

In the metal plating industry use is being made of the resin in building and repairing plating tanks, cleaning and pickling tanks, floors, gutters and neutralisation pits, also in electrolytic vessels and sewers which disperse corrosive effluents. Many other industries handling acid or alkaline liquors, such as pulp and paper mills, oil refineries, glass works, dye factories and rayon works, also make use of furan resin cements.

Furan resins can be used directly on dry wood surfaces and will adhere firmly to the wood fibre. When applied to the wood, the resin sets hard and thus effectively seals all joints and cracks. In works practice the resin cement is generally applied with a trowel and reinforced with chemical glass cloth to prevent shrinkage.

Primers Required

Portland cement must be neutralised before furan resin cements can be applied satisfactorily and steel requires to be coated with a primer or lined with rubber before treatment with furan resin. The presence of the primer or rubber accommodates the difference in expansion and contraction between the resin and steel. The resin adheres firmly to unglazed brick and tile.

Furan resin cement sets by internal chemical action, promoted by an added catalyst or accelerator, to produce a tough, durable coating or bond which is highly resistant to abrasion, impact and shock. It is dense and non-porous and has excellent adhesion to many different surfaces. Commercial furan cements set hard after 24 hours and at 70° F. remain easily workable for 90 minutes; at 80° F. the working time of the cement or mortar is reduced to approximately 20 minutes and the hardening time to 12 hours.

Most chemicals are safe in contact with furan resin but important exceptions are aniline, aqua regia, bromine, cresylic acid, hydrogen peroxide (over 30 per concentration), iodine, nitric acid, concentrated chromic acid, pyridine and sodium hypochlorite. Such corrosive chemicals as 85 per cent acetic acid, phosphoric acid (70 per cent concentration), sulphuric acid (50 per cent concentration), hydrochloric and hydrofluoric acid, etc., are all without effect on furan cement up to 280° F.

The resin has a compressive strength of 12,000 p.s.i.; water absorption of 0.5 per cent by weight and modulus of rupture of 1500 p.s.i.; coefficient of expansions for the American Permanite material per degree F. is 6.1×10^{-6} and the weight per cubic foot of resin mortar is 95 lb.

Resinification Promoters

Many patents have been taken out to cover methods of making cements and coating compositions from furfuryl alcohol and its derivatives. For example, U.S. Patent 2,095,250 discloses a method for producting an acid and solvent resistant coating comprising reacting furfuryl alcohol or a mixture of furfural and furfuryl alcohol with a promoter for resinification (e.g., sulphuric acid in a solution of diacetone alcohol) to obtain a soluble resinous condensate.

U.S. Patent 2,174,886, taken out by E. F. Kiefer, describes a method of making a plastic resinous cement by treating furfural, furfuryl alcohol or mixtures of these compounds with 5 to 10 per cent by volume of a catalyst, for resinification.

A patent taken out by H. F. Lewis (U.S. Pat. 2,267,830) covers a method of making a coating preparation by heating furfuryl alcohol mixtures with a mineral acid in the presence of an acetone solution of the powdered co-polymer of vinyl acetate and vinyl chloride. This forms a strong corrosion-resistant coating for laboratory table tops.

According to U.S. Patent 2,366,049 an acid- and alkali-proof cement can be made by modifying furfuryl alcohol with polyvinyl butyral, polymethyl methacrylates, etc. Generally, the black resin made by heating the alcohol with mineral acid possesses a high degree of resistance to solvents as well as to acids and alkalis.

WEED CONTROL ON THE RAILWAYS

Mechanised Methods of Chemical Treatment

by ERNEST A. DANCASTER, M.Sc., Ph.D., F.R.I.C.

THE importance of weed control on agricultural land and in gardens is universally recognised. Much less is heard of the need for the same preventive work on railway tracks, although this control is quite as necessary and the magnitude of the task and the requirement of chemicals are comparable with those of agriculture.

A weedy track is not only offensive to the eye but suggests laxity of management. These, however, are minor considerations compared with the harm weeds do if they are not destroyed periodically. Unrestricted growth soon causes the ballast to become choked and clogged with decayed organic matter, accumulated soil, and detritus, seriously interfering with the drainage of the track. This accumulated matter accelerates decay of sleepers and other woodwork and the corrosion of metal work. In the tropics, the track soon becomes obstructed by plant growth, except in arid regions, and even in Britain the lines may become seriously overgrown in little used sidings or tracks where traffic is intermittent.

THE Railway Executive states that British Railways today are operating over 19,631 miles of route, which involves the upkeep of 52,235 miles of standard gauge track—double and multiple main lines, sidings and station equipment. British Railways' weed-killing programme in 1950, most of which was carried out this Spring, will consume 4838 tons of chemical weed killer, principally sodium chlorate. This will supply about 1 million gal. of solution.

Weeds spread by seeding and also vegetatively by underground stems, and the latter, such as the twitch grasses, creeping thistle, etc., are the most difficult to eliminate. Plants occurring on the track vary considerably in different parts of the country, but some widely distributed species form the principal problem on all British railways. Most frequently met in the South of England are these:

Marestail (*Equisetum arvense*), creeping thistle (*Circium arvensis*), field convolvulus (*Convolculus arvensis*), coltsfoot (*Tussilago farfara*). millefoil (*Achillea millefolium*), dock (*Rumex*), various species and hybrids; dandelion (*Taraxacum officinale*), scentless mayweed (*Matricaria inodera*), groundsel (*Senecio vulgaris*), chickweed (*Stellaria media*) and various grasses.

Species of hawksbit (*Leontodon*), ragwort (*Senecio squalidus*), and black nightshade (*Solanum nigrum*) are common locally, and seedling trees may be troublesome, especially those kinds which have winged fruits, such as the ash. Marestail is extremely difficult to kill, but many other plants, such as the creeping thistle, couch grass, and other twitch grasses, are almost as resistant. For many years all essential elimination of weeds was carried out on the railway systems by the slow and costly method of hand weeding. The plants were often chopped off, leaving the roots in the ground, but owing to the longer hours and lower pay then obtaining the method was considered sufficiently economical and satisfactory. Many factors rendered hand weeding impracticable including rising cost of labour and, in some cases, electrification of the lines. The whole question of weed control had to be reconsidered.

Mechanical Methods

A choice of means was available, because in some tropical countries rapid plant growth had long before led to the introduction of more efficient methods. The railways of the U.S.A., the Dominions, and Europe had also experienced serious trouble with weeds. Mowers of the reciprocating type driven from a motor mounted on a trolley are used in America. Burning with heavy duty weed burners is also practised, a light scorching damaging the epidermis of the weeds without setting fire to the sleepers or injuring the ballast. Discing and harrowing, steaming, and chemical treatment have also been used. In Great Britain, however, effort has been confined to the use of chemical means except for minor experimental purposes.

The chemical control of weeds was at first carried out in a somewhat haphazard manner, but the trials made with known and possible weed killers and primitive improvised apparatus gave such good results that special weed killing trains were built.

There were, of course, many kinds of weed killer on the market already in use for agricultural and garden purposes, but

most of these were of little use on the railway. The many organic and inorganic weed killers which vary considerably in their action on different species of plants were not adapted to the total destruction required by the railways. A more general herbicide is required, and there should also be a soil sterilant, as fresh supplies of seeds are constantly brought to the track by wind, animals, and on the boots of the men working on the line. Plants with creeping stems constantly penetrate the track from either side of the line. Complete and permanent sterilisation has not, however, been attained and probably never will be.

One of the most effective weed killers is arsenic. either in the form of the trioxide, As_2O_3, or as sodium arsenite, Na_2AsO_3. Arsenic, however, is much too dangerous to be suitable for use on railways. All appreciably poisonous materials must, in fact, be ruled out. because of the danger to the men applying them, to others working on the track and possibly to cattle feeding near the line.

Conventional Herbicide Retained

The most effective substance is still sodium chlorate, used either as a powder or in solution. Although showing some selectivity it is a fairly comprehensive herbicide. Sterilisation of the soil is not complete, but an appreciable cumulative effect is evident after repeated applications. It has been remarked that nettles and some other plants appear to recover for a time after an application but they die out the following season, although no further applications may have been given.

It is very desirable to spray before the seeds ripen. in this country, usually during May and June. In Germany, spraying is done in April to reduce the risk of the dead weeds catching fire, a necessary precaution because of the nature of the solution used.

The fire risk enforced abandoning the use of approximately pure sodium chlorate. A mixture of sodium chlorate and soda ash was introduced on the Great Southern Railway of Ireland in order to lessen the risk. In Britain the chlorate was at first obtained from France in the preparation known as Occysol. It consisted essentially of a mixture of over 90 per cent sodium chlorate and about 7 per cent sodium fluoride, but to reduce the risk of fire the composition was modified. A sample which I examined in 1982 contained:

Sodium chlorate	64.80 per cent
Sodium chloride	27.27 per cent
Sodium fluoride	7.12 per cent

Even this reduced strength proved too dangerous and safer materials were sought. The weed killer adopted for general use on the four big railway systems is a mixture of sodium chlorate and calcium chloride in aqueous solution, a small amount of sulphuric acid being added in order to bring the acidity of the solution to about pH4, that is to approximately that of the sap, which ranges from pH3 to pH4.5. The concentrated solution obtained as the proprietary article, Atlacide, is almost as effective as pure sodium chlorate and is practically free from fire risks because the calcium chloride prevents the salt from becoming too dry.

Mobile Spraying

The control of weeds on railways may be divided into three sections:—

(1) Treatment of main and branch lines, large sidings, and marshalling yards.

(2) Treatment of small goods yards, sidings, and short single lines such as those leading to collieries or quarries.

(3) Treatment of approach roads, platforms, cable routes, etc.

The weed control of the track, large sidings, and marshalling yards is carried out by weed-killing trains designed and built for the purpose.

The spray is atomised through specially designed nozzles at pressures varying from 15-40 p.s.i. Atomisation at a greater pressure than this is undesirable as it may cause the spray to blow away. The range employed, however, is wide, a pressure varying between 25 and 30 p.s.i. being the ideal. Some railway companies have designed their own nozzles, those used on the British Railways system which was the LMS being self cleaning. The Southern, Western, North Eastern groups and LPTB all use nozzles which give a cone spray and are reasonably free from obstruction, used in conjunction with suitable strainers.

Here, and in Canada, weed killer is supplied in concentrated solution 1:2 to 1:5, which obviates the need to dissolve the dry salts during the spraying operation, a cumbersome and somewhat dangerous method which is practised on some foreign railways. The dilution with water of the liquid concentrate, carried in tank wagons or tenders, is aided by compressed air or steam from a sparge pipe on the bottom of the tender, or by paddles driven by petrol motors. The L.M.S. method is to carry the concentrate in a tank on top of the tender, from which it is run into the water below, and the mixture is then pumped around by a petrol-driven pump.

In the more highly mechanised method developed on the Southern Railway, the

water and concentrate are carried in separate tenders and are mixed by two pumps geared in the ratio 8:1 driven off the axle, which pumps them into the mixing chamber. The diluted solution passes straight to the nozzles, thus avoiding the necessity of taking on large quantities of water at night, when weed killing is done. This is an important point on an electrified railway system. The output per mile of pumps geared to the axle remains constant over a wide range of speeds and satisfactory atomisation can be obtained at 10 m.p.h. Various valves and nozzles have been designed to keep the pressure constant at varying speeds and constant output. On the Southern railway system an auxiliary engine is also employed for spraying sidings and marshalling yards.

Certain precautions are necessary when spraying "live" electrified lines; the equipments are earthed, and, in the Southern and LPTB regions, the additional precaution is taken of shutting off the nozzles over the live rail.

Strength of Solution

The concentration of the solution, as sprayed on the track, varies considerably on the different railways. The number of gallons per mile ranges from 165 to 420. This is equivalent to about 100 to 200 gallons per acre, and is, therefore, comparable with the amounts sprayed for agricultural purposes. The speed of the trains while spraying varies from about 15 to 35 miles per hour, and the number of miles sprayed per day from 12 to 100; in the Southern region it ranges from 70 to 90.

Small equipments which can be mounted on a platelayers' trolley are used for the treatment of small goods yards, sidings, and small single lines. The Great Western Railway developed an improved assembly in which a tank of 400 or 500 gall. capacity is mounted on the platelayers' trolley and the pump is driven from the axle by means of a chain, the whole equipment being towed by a petrol driven trolley.

Cable routes cannot be sprayed by the weed killing train because they are not placed at a fixed distance from the rails. It was therefore necessary to devise other methods. The weed killer is applied dry, a special sand being used as the vehicle for the herbicide. The mixture is put up in 3½-lb. tins with perforated lids for sprinkling the contents by hand. The tins are packed in cardboard cases, each containing 12 tins, sufficient to cover approximately 400 sq. yds. No mechanical dry sprinkling machines have yet been devised. Where weed growth is heavy the first and second applications have to be carried out systematically at full strength, but thereafter the cable routes can usually be kept clear of weeds by the application of the contents of an occasional tin. This dry treatment is also used wherever it is inadvisable to use liquid.

The way in which the chlorate acts upon the weeds is still not known. As the chief chemical action of the salt is as an oxidising agent, it has been suggested that this is its action on the plant. This apparently reasonable hypothesis, however, is not supported by the facts; there are other strong oxidising agents which do not produce the same effects in plants.

A plausible suggestion advanced by Boys* is that the chlorate radical has an affinity for the chlorophyll of the plant and combines with it rather as carbon monoxide combines with the hæmoglobin in the blood of the higher animals. He pointed out that, if this view is correct, plants which contain no chlorophyll, such as the fungi, should be immune to poisoning by chlorates, unless the application was heavy, when the injury would be similar to that caused by a high concentration of any salt. It has since been shown that mushrooms are actually stimulated by the application of sodium chlorate, and thus far Boys' suggestion is supported. It would be interesting to ascertain the action of chlorates on those parasitic members of the higher plants which are free from chlorophyll, such as the broom rapes. The difficulty is, of course, to attack the parasite without killing the host, but instructive results might be obtained by removing the parasites and keeping some with their cut ends in water and some in a solution of chlorate.

(*To be continued*)

* Sir C. V. Boys, *Weeds, Weeds, Weeds*, The Old Westminster Press. Wightman & Co., Ltd., 1937, p. 25-27.

Shrink-Proofing of Woollen Fabrics

IN an article on Shrink-Proofing of Woollen Fabrics (THE CHEMICAL AGE, 62, 783) it was stated that the cost of the dry chlorination process was 3d. to 6d. per lb. It has since been pointed out by the Wool Industries Research Association that the cost of the chemicals used is 3d. to 6d. per lb. The total cost is often considerably higher, as labour charges and the usual overheads have to be added to this figure.

It was also claimed that the product Chlorzyme wool had no tendency to irritate sensitive skins. While the treated wool has been shown to have a reduced irritating effect, that quality naturally depends to a large extent on the personal sensitiveness of the wearer.

CHOICE OF STIRRING APPARATUS

Insufficient Attention to Special Characteristics

THE choice of the most effective form of agitator for particular purposes from the multiplicity of types in common use is certainly not simple and, according to recently published French review, is commonly given much less study than it deserves.

P. A. Helmbold, introducing a survey of the commoner types of large-capacity instruments, in *Chimie et Industrie* (August, 64, 147-159), suggests that the selection of an agitator is often a haphazard one, insufficient attention being given to the particular requirements of the work to be done and even less to the fundamental factors governing agitation in differing conditions.

Three main types, objectives and alternatives distinguished are these: (1) Mixing two or more liquids (a) without precipitation but occasionally to produce an emulsion, (b) with precipitation or thickening; (2) mixing solids with liquids, (c) to obtain a simple suspension, (d) a solution of a solid, (e) a reaction with liquid result, (f) a reaction with solid result; (3) movement of a liquid to facilitate thermal changes, (g) for heating, (h) cooling without crystallisation, (i) cooling with crystallisation.

Operations which are not strictly stirring but have analogous movements are: (j) cleaning walls, (k) slow movement to facilitate and equalise decantation.

Power Requirements

Among the first considerations is the power required, a question not easy to decide by means of formulæ, in view of the many variable factors. A diagram may often be used such as that of International Engineering, Inc. (Dayton, Ohio), in which account is taken of volume or content, density, and viscosity, assuming the use of helical or beater type stirrers.

For other types of stirrer certain corrections are needed, as described by an I.G. Farbenindustrie engineer in 1937 (Walter Büche) and published in the VDI journal of that year. In this some of the required coefficients are given and are reproduced by Helmbold.

One instance is the solution of 9.5 per cent common salt in water, using a vessel with and without baffles. For quick results a higher speed was much more effective and economical than the use of baffles. It is true that turbulence is increased by roughened or irregular walls and by baffles, but opinions differ regarding its effect on stirring or solution, and further study is required—especially of large-scale operations. Turbulence certainly calls for a lot more power.

The different forms of beater agitators (brassage) are discussed and illustrated in the French review and special attention is given to zones of penetration and the relation existing between the times required to dissolve a given quantity of salt at continually increasing speeds. The rate of solution appears to follow laws closely analogous to those of heat transfer from a liquid to the walls of the container.

Speed Factors

Some factors governing optimum speeds are also briefly discussed, though the data involved are admittedly vague and variable. Among the more important are "pitching" cavitation, distance between the extremity of an arm and the wall, and, of course, the viscosity of material treated.

The more complex problem of selecting an agitator specially adapted to serve a particular purpose involves three major considerations: speed of stirring that will affect the whole content of vessel; power economy; and avoidance of a multiplicity of different kinds of stirring apparatus in the factory. The choice indicated in the review is related to the different kinds of work to be done, as already classified. It considers these instances:—

(a) Mixing of two or more liquids without precipitation.—In the simplest cases a plate or helical type machine will do very well. For liquids of different densities a strong upward movement is required, e.g., turbine with suction pipe, or two helices. For very heavy or viscous mixtures baffles and moderate speed are desirable. Special means will, of course, be needed for emulsifying.

(b) Mixing liquids with precipitation.—If the precipitate is light and flaky, similar apparatus to that in (a) will serve; but, if pasty or very viscous, a hand-worked stirrer is better, making provision for varying speed.

(c) Suspension.—These depend on the size of the particles in suspension, but high speed and preliminary grinding are generally necessary. The helical type seems to be generally preferred under speci-

fied conditions as to form of container and speed of working. Where damage or inconvenience from large particles is anticipated, it is often desirable to affix special arms or cutters on the shaft above the screw or helix.

(d) Solution of solid.—The technique here is similar, but more complex. A formula is given for speed of solution in terms of the surface area of solid S, the amount of solid absorbed by the liquid at saturation point and up to it (Cs and Ct) and K, a coefficient (empirical) for each solid and liquid. The speed of solution then is KS (Cs − Ct).

(e) Reaction without solidification.—A first essential here is to keep the solid constantly in the zone of maximum work or stirring, *i.e.*, at or near the centre. A German method is noted in which vessels used are of 30 or 40 cu. m. capacity, with bases in the form of inverted cones, the stirring agent, steam or air, being injected at the points of the cones.

(f) Reaction with solidification.—Account has to be taken of gradual solidification of the whole or part, for which special provision has to be made, including particularly speed control.

(g) Movement to facilitate heat exchange.—This as a rule requires maximum peripheral speed. Heating or cooling is commonly done by horizontal or vertical coils.

(h) Cooling, without crystallisation.—This is similar to the preceding case (g), but only a vertical coil can be used.

(i) Cooling, with crystal formation.—Crystals tend to form on the cool surfaces, such as the container walls. Stirring speed is adjusted so that the forming crystals act, according to their speeds, as cleaners. Where the crystals tend to adhere to the walls scrapers must be used. In many cases it is, of course, better to feed in fresh material at a temperature sufficiently high to prevent undue cooling. If large crystals are required movement is necessarily reduced. This adjustment is a difficult problem for which the complete solution has not yet been found.

Construction Economy of Outdoor Plants

THE wider application in U.S. industrial development of plant installations on the " outdoor " principle, extensively adopted by their chemical industries, was recommended at the recent meeting in Minneapolis of the American Institute of Chemical Engineers. There are several examples of the practice here, notably in some of the plants dealing with volatile materials, including the newer assemblies erected by British Industrial Solvents, Ltd., near Hull.

The opinion that the open-type plant may be built with less material, which in times of national emergencies would permit more production units to be built, was offered in a symposium on " Indoor Versus Outdoor Plants " given before the AICE. The leader of the symposium was Dr. J. R. Minevitch (Boston, Mass), of E. B. Badger & Sons, Company, a design and construction firm for the chemical and petroleum refining industries.

Dr. Minevitch said that in the southwest, in a recent expansion in the chemical field which cost many million dollars, 10 per cent of the construction costs were saved because of the prevalent use of outdoor and semi-outdoor construction.

" Such economical building practices are not limited solely to the chemical and petroleum field," said Dr. Minevitch, " since the principles may be expanded to other industries and production units, though possibly modified." As an example, he cited the new trend of building steam-power plant as semi-open units. For a million dollar plant investment, 28 per cent of the cost would normally be spent for construction of enclosed buildings, but if this same plant were constructed as an open type, only 17 per cent of the cost would be spent on buildings, he said.

The other speakers stressed advantages other than savings in cost. Mr. W. H. Williams, of the Dow organisation, analysed the effect of weather on such construction. He claimed that by means of proper engineering, unhoused processing plants operated without a fall in temperatures which at times went down to as low as 20° below freezing point.

The engineer from the Du Pont Company, Mr. H. S. Kemp, discussed the experiences of his company in successfully designing and installing an outdoor acetic acid concentration plant. He said substantial savings were realised in the construction of the outdoor plant since brick walls, their concrete foundations and building heating were eliminated, and lighting equipment was reduced.

Mr. Kieweg stressed the safety features of such construction, especially where ventilation of toxic and hazardous vapours is a factor.

RAPID TESTING OF WELD STRENGTHS

Marked Advances Using New Pressure Plant

A NEW pulsating pressure plant installed at the Abington centre of the British Welding Research Association was the principal item of interest shown to the technical Press during a visit to Abington on September 19.

This plant is intended to test vessels and other products by repeated applications of pressures. There are two main advantages of this type of test over the normal static pressure test. First, vessels which will be subjected to varying pressures in service can be tested under similar conditions during their initial development, so that a relation between material properties, service stress and life expectation can be established. Secondly, this test is said to be capable of distinguishing between two designs of otherwise equal merit far more readily than will a static test.

The simplest form of plant for this purpose is constituted by a pump whose connection with the test vessel is alternately "make and break." Several designs of pulsating pressure plant are possible, the main difference between them being the manner in which the valve which controls this connection is operated.

In the plant at Abington this valve is controlled by a pneumatic-hydraulic arrangement. The controlling system consists of a piston travelling in a cylinder (marked "servo piston" and "servo cylinder" in the diagram) which is so designed that the piston will move when the pressure difference between its two sides is between 1 and 1.5 per cent. The pressure in the test vessel is communicated to the space in the cylinder on one side of this piston and the pressure set in the "upper-pressure limit vessel" is communicated to the other side.

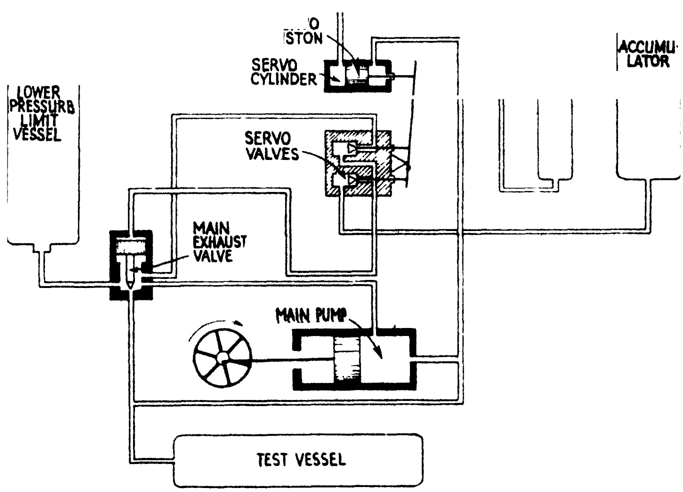
The main exhaust valve controls the passage of fluid from the test vessel to the large cylinder in which the lower pressure limit is set. When this valve is open, the test vessel and the "lower-pressure-limit vessel" ore in connection, and the pressures in both are equal.

The Servo Operation

When the valve is closed, the main pump draws fluid from the lower pressure limit vessel, and pumps this into the test vessel. This pressure is communicated to one side of the servo piston, and when it reaches $1\frac{1}{2}$ per cent more than the upper pressure limit the piston travels along the cylinder. This moves the connecting lever and operates the two servo valves, which are attached to the lever in such a way that when one is open the other is closed. When the test vessel has been pumped to its upper limit and the piston has moved along the cylinder, the upper servo valve is open and a direct passage is available for fluid from the top of the exhaust valve to the suction side of the pump.

Because there is now very litle pressure above the exhaust valve and the full upper limiting pressure below it, this valve is forced open. As soon as this occurs, fluid flows from the test vessel into the

(continued at foot of next page)



Essentials of Current Patent Procedure

Some Changes Introduced by the New Act

THE Patents Act of 1949, which came into effect at the beginning of this year, did not materially affect the main principles of patent law, although certain changes are of importance to the inventor and manufacturer.

The main changes relating to applications for patent protection are dealt with in a 16-page booklet issued by King's Patent Agency, Ltd. Another valuable guide for manufacturers to the new Patents Act and its changes has been written by Mr. Robert Lochner, barrister-at-law, who is standing counsel to the National Union of Manufacturers on patents and designs. The book is published by the National Union. (2s. 6d.).

Adequate Description

An application for a patent, which must be filed at the Patent Office, can be accompanied either by a provisional specification or a complete one. A provisional specification, however, needs to contain an adequate description of the invention or process. Badly drafted, it may result in the invalidation of the patent, or in the post-dating of the application.

Full patent rights date from the filing of the complete specification, and the patent runs for 16 years from this date, provided the necessary renewal fees to maintain it are paid. According to the 1949 Act, every complete specification is required particularly to describe the invention and the method by which it is to be performed. It must disclose the best method known to the applicant of performing the invention, and must end with a claim defining the scope of the invention.

Limiting Claims

The claims of a complete specification must relate to a single invention, must be clear and succinct, and must be fairly based on the matter disclosed. These claims are regarded as the most important part of the application and, if drafted too narrowly, may leave the way open for the easy avoidance of the patentee's rights. If, on the other hand, these claims are drafted too widely, the whole patent may be bad for lack of novelty, or of inventiveness. The preparation of these claims calls for technical and specialised skill.

An important matter affected by the new Act is that, once an applicant had filed a provisional specification under the old law, he could safely use and publish details of his invention, and would not thereby deprive himself of any priority rights in the invention or in its development. This may not hold good under the new conditions and, until the provisions of the new Act relating to priority dates have been construed by the court, it is advised that it will be safer to assume that the old priorities will continue to apply to the invention described in the provisional specification but may not apply to its legitimate development.

Mr. Robert Lochner, in his book, states that this is a matter of great importance to those manufacturers who, in the past, have adopted the practice of applying for provisional protection for an invention prior to testing on a commercial scale.

Registration Costs

Fees, as from June 1, 1950, for an invention of average complexity requiring, say, a provisional specification of about 1000 words, are: Provisional (12 months' cover) £6 15s.; complete specification, following provisional patent, including Government stamp fees (except sealing fee) for first four years from date of filing, £17 10s.; complete patent (no provisional) for four years as above, £19 10s.

Amendments and hearings, except when of a very trivial nature, involve a nominal extra charge, usually about £3 3s. to £5 5s. Drawings, when required, are charged according to the work involved in their preparation, averaging £2 5s. for a simple subject. The sealing fee, payable on acceptance, including an agency charge, is £2.

RAPID TESTING OF WELD STRENGTHS

(*continued from previous page*)

lower pressure limit vessel, and the pressure in the test vessel drops to that in the lower limit vessel.

Simultaneously the pressure on one side of the servo piston drops to this lower limit, and causes the piston to travel in the reverse direction, closing the upper servo valve and opening the lower one. This allows fluid under pressure from the accumulator to pass to the top of the exhaust valve piston. The pressure on the top is now greater than that at the bottom, and consequently this valve closes and a fresh cycle of pumping is begun.

Technical Publications

PROBLEMS involved in production of a pressure-tight circumferential seam and the progress made towards their solution are discussed in " The Welding of Thick Aluminium Alloy Plates by the Argon Arc Process" published in "Welding Research" (Vol. 4, No. 4) (British Welding Research Association).

* * *

THE training of future export executives, of considerable importance to the commercial prospects of the country, has been closely studied by the Institute of Export, whose current syllabus of education, now available, has been revised to meet present economic and commercial conditions.

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PLASTIC mouldings for electrical connectors and connector strips are the subject of a new illustrated leaflet available from Precision Components (Barnet), Ltd.

* * *

THE gas phase in equilibrium with a solution of carbon, oxygen, hydrogen, and nitrogen in liquid iron is evaluated by J. D. Fast in " Philips Research Reports " (Vol. 5, No. 1), which also presents physical, chemical and technical papers covering the results of experimental and theoretical research carried out in the laboratories of the Philips industries.

* * *

AN information leaflet from Crompton Parkinson, Ltd., London, describes the Magnicon, a self-regulating alternator which has been developed by the Macfarlane Engineering Co., Ltd., Glasgow, to obtain the advantages of automatic voltage regulation without the additional cost of special regulating equipment.

* * *

MOTORS and control gear for laboratory and industrial use are listed in a booklet obtainable from Higgs Motors, Ltd., Witton, Birmingham.

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THE need to keep the public informed of achievements of medical science—especially discoveries made possible by experiments on animals—is the object of the journal of the Research Defence Society. The publication, formerly *The Fight Against Disease*, is to appear quarterly or bimonthly under the new title of *Conquest*. Particular attention will be given to progress in the development of such agents as insulin, the sulphonamides, penicillin and other antibiotics, natural and synthetic insecticides, hormones and Antrycide.

PROPERTIES and uses of regenerated cellulose film were the subject of a paper recently delivered by E. H. Dock to the Southern Area of the Institute of Packaging. The paper, with the ensuing discussion, is reproduced in the summer issue (No. 9) of the institute's journal.

* * *

ALUMINIUM coatings on steel are the subject of technical notes in the September issue of " Aluminium News " published by the Aluminium Union, Ltd., Montreal, Canada. The four main processes in commercial operating today—hot dipping, cladding by rolling, spraying and calorising—are described.

* * *

METHODS of reducing air pollution by the drop forging industry in the U.K. and the U.S.A. are compared in the autumn issue of " Smokeless Air " (No. 75), journal of the National Smoke Abatement Society. An account is also given of the work of the British Coal Utilisation Research Association at Leatherhead, and a first report is included of the United Staes Technical Conference held in Washington in May dealing with the solution of all air pollution problems."

* * *

PUBLICATION of *Spectrochimica Acta*, the international research journal devoted to spectrochemistry, has been taken over by Butterworth-Springer, Ltd., starting with Volume No. 4, of which the first number is now available. The editorial policy remains unchanged. Hilger & Watts, Ltd., Hilger Division, have been appointed sole selling representatives in Great Britain.

* * *

A NEW subject has been introduced in the DECHEMA series, " Exchange of Experience." (Deutsche Gesellschaft f. chem. Apparatewesen E.V.). Professor K. Thormann, Dr. Eng., has collected all the essential facts about laboratory distillation and rectification under the heading " Laboratory Distilling Apparatus."

The work, which covers 69 pages, is divided into two sections, one dealing with distillation apparatus in which a column is employed, and the other with apparatus dispensing with the column. There is a general discussion of the different types of apparatus in use and a section entitled " Principles for the Operation of Distillation Apparatus with a Column." An index of standards is included.

The Chemist's Bookshelf

QUANTITATIVE ULTRAMICROANALYSIS. L. Kirk. 1950, New York. Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. viii + 310. Figs. 113. 40s.

To those familiar with chemical operations on the microgram scale, this book will probably prove to be both a stimulus and a disappointment. From the time when, in the 1930's, an organised attack began to be made on problems in this range from an academic point of view rather than as a hand-to-mouth solution of some specific problem, the imagination of many analytical chemists has been stirred by the ingenuity displayed in devising techniques which would enable the worker to handle and to measure the extraordinarily small amounts of material involved. The techniques developed are in many cases as different from the established techniques of microanalysis as the latter were from the procedures of classical chemistry. In this book many of the techniques have been described within one cover. Frequently, the original methods have been modified and improved, either as research or as teaching operations, by Professor Kirk, who is one of the foremost workers in the field, and his co-workers. In certain respects the material will be directly applicable by workers requiring just these techniques or slight modifications of them.

The disappointment will arise from the feeling that the author has attempted either too little or too much. Most people wishing to develop microgram methods may be assumed to be reasonably familiar with commoner aspects of modern analytical chemistry. Consequently the space devoted, for example, to the principles and practice of ordinary colorimetry could have been saved, or used to advantage in other directions. To dismiss the polarograph in 14 lines when colorimetric procedures are dealt with so fully seems to indicate lack of balance.

Space thus saved might well have been used to include qualitative procedures, which must, in many cases, precede quantitative analysis. The techniques are sufficiently closely allied to be dealt with, at this stage of development, within the same handbook. The valuable pioneering work of Benedetti-Pichler and his co-workers in the field of qualitative inorganic analysis would thus have received its due credit. It is a matter of some wonder that in the 350-odd references the name of Benedetti-Pichler can be found only twice.

The last chapter, dealing very briefly with physical methods, could also perhaps have been expanded, since a number of measurements of physical properties other than melting point, boiling point, density and conductivity have been described in the literature, which use sample amounts no larger than those required for the methods detailed in the book. Such methods would be required from time to time by many microanalysts.

Three chapters are devoted to descriptions of the apparatus and techniques which have been developed for titrimetric and colorimetric methods on microgram samples. Detailed examples of a wide range of analyses utilising these techniques and derived procedures are then given, and a number of gas-volumetric and spectrophotometric methods are also described at some length.

From a survey of these as an entity, it is quite clear that the omissions already mentioned can largely be explained by the author's approach to the subject as an exponent of biochemistry and his preoccupation with the methods as they can be induced to serve the biochemist. The determinations which have been described in detail are largely those with which the biochemist is concerned. Many of the major advances described by Professor Kirk have been made by, or to fill the needs of biochemists. Nevertheless, it is perpetuating a one-sided view of things to suggest, as does this book in its choice of material, that it is principally in the field of biochemical analysis that microgram procedures will find chief use.

Analytical chemists who are concerned with minute samples will undoubtedly make these and similar criticisms for themselves. But it is likely that they will, however, use the book for many years as a valuable first source of techniques, and as an indispensible part of their everyday reference literature.—C.B.W.

OVERSEAS CHEMISTRY AND INDUSTRY

INDUSTRIAL DEVELOPMENT IN JAPAN

Large Expansion Achieved with U.S. Aid

THE substantial development of industrial production in Japan under American administration is reflected in an economic review of 1949 issued by the International Reference Service of the U.S. Department of Commerce.

Appreciable progress was made during the year in most sections of the chemical industry, aided by a favourable raw material and power situation.

The index of chemical production in December reached about 92 per cent of pre-war (1932-36 average), a considerable increase over the monthly average for the year as a whole (80.6 per cent). The average monthly index in 1948 was 56 per cent.

Although the output of all major chemical fertilisers recorded significant gains, the production of calcium cyanamide, which increased 71 per cent over 1948, was particularly important in raising the over all index for chemicals. Supporting the rise in the index of chemical production was the increased output of many industrial chemicals, agricultural insecticides, dyes, printing ink and synthetic resins and plastics.

Increased Export Products

Production of important export commodities such as glass, rayon and other textiles, soap and processed foods increased appreciably, partly because of the remarkable achievement in the output of soda chemicals, which are the basic raw materials of these industries.

Production of soda ash for the year totalled 121,943 metric tons compared with 75,111 in 1948; post-war records were established in the production of 149,676 metric tons of caustic soda, 407,500 tons of salt, 86,691 tons of hydrochloric acid, 35,959 tons of bleaching powder and 10,419 tons of liquid chlorine.

Other important developments in the chemical field were the 175 per cent increase in production of printing ink over 1948; the output of 1,577,435 sq. metres of film compared with 1,305,519 metres in 1948; and the production of a wider variety of dyes.

Towards the end of the year Japan was producing 146 different dyes, at least 10 of which were manufactured for the first time since the end of the war. The quantities of some dyes produced permitted the resumption of the export of dyes at the beginning of the second half of the year. These exports, however, amounted to less than 4 per cent of dye production for the period.

As in previous years, and despite the further improvement in production during 1949, Japan imported considerable quantities of chemicals, principally chemical fertilisers. Imports of chemicals totalled $55,661,000, of which fertilisers and fertiliser materials (mainly phosphate rock, phosphates, and potash) amounted to more than $40,600,000. Exports of chemicals including drugs and medicines, on the other hand, amounted to about $4,555,400.

Imports and exports of chemicals by commodity groups and subgroups in dollars, were as follows:—

	Imports	Exports
Chemicals	55,661,048	4,555,412
Pigments paints and varnishes	6,344,568	936,858
Drugs and pharmaceuticals	1,413,538	2,397,629
Chemical fertilisers	40,607,234	39,291
Insecticides, pesticides, and other fertilisers	1,369,207	202,871
Explosives	—	4,546
Toiletries and cosmetics	494,789	73,459
Industrial inorganic chemicals	3,039,341	690,616
Industrial organic chemicals	1,360,241	84,241
Industrial organic chemical products	714,950	—
Chemical specialities and miscellaneous items	317,180	125,901

The index of mineral production averaged 103.9 for 1949 (1932-36 equals 100), representing an advance of 15 per cent above the 1948 average. Most of the components of the index (sulphur, crude petroleum, pyrites, zinc ore, lead ore, copper ore, iron ore) rose more than the over-all average, ranging from 22 per cent for crude petroleum to 53 per cent for sulphur. Coal production, which has the greatest weight in the mining index, however, advanced only 13 per cent over 1948 and lignite production was about 19 per cent below that of 1948. The coal and lignite industries, however, had recovered more rapidly than the other mining industries in the earlier post-war period.

The year 1949 marked a significant upward trend in production of petroleum. The average monthly output of crude was

18,129 kilolitres, a 22 per cent increase from the monthly production in 1948. Output of refined petroleum products also increased to a monthly average of 16,214 kilolitres, a 10 per cent advance over the 1948 average.

During the summer of the year under review new geophysical equipment arrived in Japan from the United States to be used in a survey of the oil-producing regions of Niigata, Yamagata, and Akita prefectures, and in other potential oil-producing basins, in an effort to find new reserves for increased domestic production. (Japan's producing industry supplies only about 10 per cent of the country's requirements of petroleum products.) New reserves of 6,540,000 barrels were proved during the year.

The first step toward placing Japan's Pacific Coast oil refineries in operation in the post-war period was taken later in the year. SCAP granted approval for the repair and rehabilitation of five refineries which were expected to be placed in operable condition about the beginning of 1950.

The Japanese Government, industrial leaders, scientists, and others showed increasing readiness to improve Japan's industrial techniques with the help of U.S. technical experts.

Dutch Chemical Production Programme

THE State Mines of Limburg, Holland, have announced proposals for substantial extension of their chemical output. More than 13 million guilders is to be invested in its nitrogen division, and the total fertiliser output planned in 1952 is 538,000 tons. Estimates of other production next year are: tar products 56,000 tons, benzene 19,000 tons; sulphuric acid 80,000 tons; ammonia 29,000 tons; ethyl alcohol 36,000 hectolitres.

The pilot production of synthetic phenol is reported to have given satisfaction, but the State Mines are not intending at present to develop this or any other new productions, in spite of the persistent call from Dutch industrialists.

An interesting new product of the State Mines, styled Caprolactum, is the basic material of the Dutch competitor of nylon (Encalon), which is now being produced by Algemene Kunstzijde Unie after successful pilot plant trials. Caprolactum is to be polymerised by this firm at Emmen in a large plant to be erected in the near future. Large-scale production of Encalon is expected to begin in 1952.

DEVELOPING NATURAL RESOURCES

New Enterprises in Brazil

EXPORTS of peppermint oil from Brazil decreased from 88 tons in 1948 to 39 in 1949. American buyers reduced purchases, alleging that the Brazilian oil, which is extracted from the "arvensis" variety, is less suitable for dental paste and perfumery than the "piperita". The latter will in future be grown in San Paulo in order to recapture the North American market. Great Britain was the chief purchaser last year, followed by France and Holland. The price averaged £3578 per ton.

* * *

THE Refinaria Paulista S.A. is to build a cellulose and paper factory in San Paulo, which will operate with bagasse of sugar cane The process followed will be that of the "Celdecor South Africa", and part of the equipment will be purchased in Great Britain. The company aims at producing 5000 tons of paper annually and should begin operating within two years. The bagasse will be obtained from cane used in the distillation of alcohol. It will be technically more advanced than the three similar factories planned earlier. Unlike those in the Philippines and India, which have separate installations for the production of cellulose and paper, the San Paulo factory will have one complete installation, bagasse entering on one side and the finished product leaving on the other.

* * *

THE San Paulo State Government is about to install a factory, the first of its kind in Brazil, to process soya beans. As a start it will produce 6 tons of edible oil and flour daily. The oil may also be used in the preparation of glycerin, paints, varnishes, celluloid, etc. The factory will be experimental, and, if successful, a group of industrialists will build another for commercial purposes in 1951 at a cost of £240,000. The soya bean hitherto has only been cultivated in Brazil as a fertiliser and for cattle food.

* * *

THE State of Rio Grande do Sul has now 49 million black-wattle trees (black acacias). Small groves have recently been planted in other States, and Brazil expects to produce 16 million lb. of extract for the tanning industry in 1950. Approximately 60 per cent of the output will be solids, instead of the liquid form, in which it was produced in the past. This will facilitate export shipments.

PROGRESSIVE CANADIAN RESEARCH

Important Work on Fundamental Themes

THE 33rd annual report, for 1949-50, of the National Research Council of Canada reflects steadily increasing activity at the Chalk River, Ontario, atomic energy project. The radioactive Cobalt 60 and industrial radiology in place of radium being produced there for use in medical is being made in the NRX reactor with higher specific activity than has been attained anywhere else in the world. This energy project. The radioactive Cobalt 60 unit permits sharper pictures to be made than would be possible with a more diffuse source.

The highly successful performance of the NRX pile, providing the greatest known flux density of neutrons, is cited as a tribute to the ability of the Canadian engineers and scientists. They have also acquired experience with a heavy-water reactor, which is thought to have unique possibilities.

In the pure chemistry branch, the National Research Council reports considerable expansion during the year in the organic chemistry section. Work on alkaloid chemistry has been continued, and some important results have been obtained on the synthesis of alkaloids in plants, using radioactive carbon as a tracer. In photochemistry, work has been continued on free-radical reactions, and much more reliable data have been obtained for a wide variety of methyl-radical reactions.

Calorimetric Measurements

Much work in the surface chemistry section has been done on the establishment of the low temperature scale for calorimetric measurements. A second mass spectrometer has been constructed for the detection of short-lived intermediates in gas reactions. In colloid chemistry a new method has been developed of measuring vapour pressures of solutions which shows great promise as a method of determining molecular weights of low molecular-weight polymers and other substances.

One of the applied chemistry branch projects started last year by the chemical engineering section is the application of the fluidised-bed technique to the recovery of petroleum from Alberta tar sands and from New Brunswick oil shale, and of elemental sulphur from sulphide ores. The tar sands investigation, which has now reached the pilot-plant stage, is expected to prove a practical method when additional or emergency sources of liquid fuels are required.

Other major projects under investigation deal with the use of lignin as a compounding agent in synthetic rubber and the production of chemicals from petroleum, the latter being concerned principally with catalysts. The work on lignin is being sponsored and financed by industry. Other projects sponsored by industry are concerned with catalysis and lubrication.

In the physics division, the spectroscopy group, using a 21 ft. grating spectrograph, has investigated the spectrum of isocyanic acid (HNCO) and determined the structure of this molecule. The nuclear spin of the He3 isotope has been determined from its band spectrum and the rotation-vibration spectrum of the HD molecule has been observed.

The Raman spectrum of fluorine has been obtained for the first time.

Wider Use for Czech Glass

THE Czechoslovakian glass industry is reported to be making a partial diversion of its production from ornamental goods to more utilitarian ware, including a wide range of chemical and laboratory glass and parts of technical machinery and instruments. These include forks and thread guides for textile machinery, precision measuring instruments, heating apparatus and heat-resisting utensils, and a number of items where glass is taking the place of metals, such as piping, valves and pumps.

Representative specimens of this work were displayed at the 51st Prague International Trade Fair. Apparatus to stand temperatures above 1500° C. is being made of quartz glass, and another special product is the television valve in which Czechoslovakia claims to hold a prominent place.

Growing Importance of Alberta

In deciding to establish an independent trade commissioner post at Edmonton, the British Government has been influenced by the growing economic importance of Alberta, stimulated by the development of her resources of oil and natural gas. The new officer is Mr. Frederick Ingilby Lamb, who was until recently one of H.M. trade commissioners at Montreal. He took up his new duties on September 15.

Next Week's Events

MONDAY, OCTOBER 2

Royal Institute of Chemistry

London: School of Hygiene and Tropical Medicine, Keppel Street, W.C.1. 6.30 p.m. "Coal Smoke—Its Nature and Prevention" by Dr. A. C. Monkhouse. (In conjunction with the London Section, Society of Chemical Industry).

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. F. L. Griffiths: "The Heat Pump."

Brewers' Exhibition

London: Olympia, National and Empire Halls (until October 6).

TUESDAY, OCTOBER 3

Incorporated Plant Engineers

Cardiff: Grand Hotel, Westgate Street, 7.30 p.m. South Wales Branch. H. Power: "Transmission Problems."

Chemists' Exhibition

London: New Royal Horticultural Hall, Westminster (until October 6).

WEDNESDAY, OCTOBER 4

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. G. Davenport: "Notes from My Welding Experiences."

Society of Public Analysts and Other Analytical Chemists

London: Burlington House, Piccadilly, W.1, 7 p.m. A. M. Smith, A. Comrie and A. K. Simpson: "The Evaluation of Liming Materials for Agricultural Purposes"; H. N. Wilson: "The Accurate Determination of Phosphoric Anhydride by means of Quinoline Phosphomolybdate"; L. Brealey: "The Determination of Potassium in Fertilisers by Flame Photometry."

THURSDAY, OCTOBER 5

British Institution of Radio Engineers

Manchester: Reynolds Hall, College of Technology, 7.15 p.m. Dr. P. F. R. Venables: "Education in Industry."

International Bottling Equipment Exhibition

Paris: (until October 15).

International Packaging Exhibition

Paris: (until October 15).

Royal Institute of Chemistry

Dagenham: S.E. Essex Technical College, Longbridge Road. 6.30 p.m. "The Public Analyst and His Work" by Thomas McLachlan, F.R.I.C.

FRIDAY, OCTOBER 6

British Paper and Board Makers' Association

Manchester: The Engineers' Club, Albert Square. 6 p.m., Dinner. 7 p.m. "Some Aspects of China Clay in Paper" by Dr. N. O. Clark and R. J. Booth.

The Institute of Fuel

Liverpool: Radiant House, Bold Street, 7 p.m. "Steam Generation": Brains trust (R. G. Evans, A.M.I.Chem.E., W. Murray, F.R.I.C., R. H. Thompson, B.Sc. and J. S. Brundritt).

Society of Chemical Industry

Edinburgh: 10 a.m. Opening of two-day joint meeting of the Fine Chemicals Group and Edinburgh Section. Dr. F. Bergel, chairman of the group: "The Biological and Therapeutic Significance of Organic Phosphates Occurring in Nature." Afternoon: Visit to I.C.I., Grangemouth. Glasgow: Royal Technical College, 7.15 p.m. Joint meeting of the Food Group and the Glasgow Section. Dr. E. H. Callow (DSIR Low Temperature Research Station, Cambridge): "Frozen Meat."

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. J. McKillop, chairman's address: "The Theory and Practice of Accident Prevention."

Oil and Colour Chemists' Association

Cheetham: Town Hall, 6.30 p.m. Second post-graduate lecture. Dr. A. S. C. Lawrence: "Topics in Colloid Chemistry."

SATURDAY, OCTOBER 7

Society of Chemical Industry

Edinburgh: Fine Chemicals Group and Edinburgh Section. Anatomy theatre, the University. 10 a.m. Professor G. F. Marrian, F.R.S. Third Lister Memorial Lecture. "The Adrenocortical Hormones."

Institution of Chemical Engineers

Manchester: Reynolds Hall, College of Technology, 3 p.m. Professor D. M. Newitt, president: "Operating Conditions in High Pressure Plant."

Chemical Engineers' Examinations

Changes have been made in the period in which are held the examinations of the Institution of Chemical Engineers. It has been customary hitherto to hold the A and B sections of the examinations between January and March, and the C-F sections in April and May. In 1951 the A and B sections will again be held from January to March but the C-F sections will be held in September. The candidates who would normally be taking sections A and B in January 1952 will instead take these examinations in September 1951.

OVERSEAS

Thailand Tin Production

Thailand's tin ore production in June was 1210 tons. This figure, though a post-war record, is less than half the total produced in December, 1939—2457 tons.

Italian Import Licensing

Included among the goods which may be imported freely into Italy from member countries of the OEEC is a wide range of chemicals, metallic ores, crude tar oils, oils and products of the direct distillation of coal, rare gases, radioactive elements and their compounds and various alcohols and acids. A detailed list is published in the *Board of Trade Journal* (159, 2805).

New Canadian Oil Refinery

Construction of an oil refinery at Froomfield near Petrolia, Ontario, was announced recently by Mr. Harild Rea, president of Canadian Oil Companies. The refinery, estimated to cost $18 million, will process crude oil from Alberta. Processing is to begin in April, 1952, and it is expected that a saving of U.S. $17.5 million yearly will be effected.

Russia Resumes Manganese Shipments

Notwithstanding the strained relations between the United States and the U.S.S.R., the latter is again shipping substantial quantities of manganese to America. Formerly a major U.S. supplier, Russia virtually cut off shipments after the United States in 1948 restricted exports of strategic war materials to Russia. In July Russian shipments to the U.S.A. totalled $800,000 in value, compared with $200,000 in February.

Monsanto's New Texas City Plant

The Monsanto Chemical Company, St. Louis, Mo., U.S.A., is shortly to undertake an expansion programme for its Texas City operations which, in the next few years, will involve the expenditure of about $30 million. The principal objective is to expand production of acrylonitrile and related chemicals direct from acetylene. Construction of the new facilities is to begin immediately and the size of the present plant at Texas City is expected eventually to be doubled. The principal outlet for the acrylonitrile will be in the production of synthetic textile fibres by Monsanto's recently formed subsidiary, the Chemstrand Company, and by others chemical organisations.

Canadian Synthetic Rubber

Expansion of the Government's synthetic rubber plant at Sarnia, Ontario, was announced recently by Mr. Howe, Canadian Minister of Trade and Commerce. The project, which will cost $6.6 million, will enable the plant to cope with its domestic and foreign orders, which at present exceed the productive capacity.

New Carbon Black Unit

The Continental Oil Black Company has been organised jointly by the Continental Carbon Company and the Continental Oil Company in the U.S.A. to produce 25 million lb. annually of high abrasion carbon black from oil. It will build a $1.5 million plant at Lake Charles, Louisiana, which is scheduled for completion early in 1951.

Possible Cortisone Substitute

A report in the *Lancet* indicates that Netherlands scientists hope that a certain liquorice extract may prove a possible substitute for cortisone. The extract is said to react in a similar way to deoxycortone and ACTH, both of which in effect resemble cortisone. Although the extract had a negligible effect on a patient with rheumatoid arthritis it is hoped that, with further research, the liquorice extract will prove useful in curing other diseases.

Scandinavian Light Congress

At the Scandinavian Light Congress, held recently at Oslo, speakers voiced the opinion that good lighting increased productivity by 5 to 25 per cent and reduced the amount of faulty work by 20 to 25 per cent. It was urged that lighting technique should be a subject in the curriculum at technical colleges. The Technical High School in Denmark has in fact already established Scandinavia's first professorate in lighting technique.

Over £4 M. More for Australian Chemicals

A further addition to the capital of the I.C.I. group in Australia, which will bring to £10 million the total paid up capital of I.C.I. of Australia and New Zealand, Ltd. is being secured to expand the scope of the subsidiary's production and trading. The issue, in Melbourne, of £1,006,500 ordinary £1 shares at 22s. 6d. is being made publicly and, with the recent £3 million 4 per cent debenture issue, will add £4,125,818 of new capital. Hitherto, most of the Australian group's ordinary capital (64½ per cent) has been provided by I.C.I., Ltd.

PERSONAL

MR. J. S. RAMSDEN has decided to relinquish his seat on the board of the British Thomson-Houston Co., Ltd., on September 30, after more than 40 years' service with the company—15 of them as a director. He will, however, remain with the company in a consultative capacity, and is retaining his seat on the boards of the British Thomson-Houston Export Co., Ltd., Ferguson Pailin, Ltd., and the Switchgear Testing Co., Ltd. Mr. Ramsden obtained his early technical education in Bolton, Lancs., and later at the Manchester School of Technology. After gaining experience as a textile engineer and later with the British Westinghouse Company in Trafford Park and with the Electric and Ordnance Accessories Co. (Vickers, Ltd.), he joined the BTH drawing office staff in 1910. He has been chairman of the Dynamo and Motor Association since 1932 and is a member or officer of many other organisations concerned with electrical engineering.

Newman Industries, Ltd., announces that MR. E. B. PIGGOTT has resigned from the position of secretary of the company for health reasons. Mr. Charles Bush, previously an executive of Wimpey, Ltd., has been appointed to succeed him.

MR. GAVIN LAWSON, chief chemist and director of Cumming, Parsons, Ltd., essence distillers. left £8671 gross, with net personalty £7733.

Obituary

MR. JOHN BLACK, Dunlop's divisional manager for Scotland, has died suddenly at the age of 54.

The death has occurred of MR. FRANCIS HERBERT JOHNSON, sales manager of Fassett and Johnson, Ltd., Clerkenwell.

The death has occurred of MISS W. E. FENN, editor of *The Rubber Age and Synthetics*, who was also a director of the company, Rubber & Technical Press, Ltd.

Fertilisers Advisory Committee

A reconstituted committee to advise the Ministry of Agriculture on the making of regulations under the Fertilisers and Feeding Stuffs Act, 1926, was announced this week. The chairman is Mr. Edmund Bacon and its members include Mr. H. H. Bagnall, Mr. A. M. Cameron, Dr. E. M. Crowther, Dr. D. N. McArthur, Dr. J. Manning, Mr. G. Taylor, and Mr. Eric Voelcker. Dr. J. R. Nicholls, of the department of the Government Chemist, will be among the representatives of Government departments.

BEILBY MEMORIAL AWARDS

INVESTIGATIONS related to chemical engineering, metallurgy and fuel economy carried out by young men who have been concerned in original independent work of exceptional merit over a period of years, will again be recognised this year by awards from the Sir George Beilby Memorial Fund.

The administrators of the fund, representing the Royal Institute of Chemistry, the Society of Chemical Industry and the Institute of Metals, will decide early next year to whom these awards shall go. Recommendations concerning work of merit on the lines indicated are invited, before January 1, 1950. More than one award may be made; last year there were three, each of 100 guineas, for works on mechanical properties of metals, the behaviour of gases in metals, and the study of carbon and its oxidation by steam (THE CHEMICAL AGE, 62, 650).

Recommendations should be addressed to the convener of the administrators, Sir George Beilby Memorial Fund, Royal Institute of Chemistry, 30 Russell Square, London, W.C.1.

Laboratory Explosion Verdict

CHEMISTS at the Wrexham inquest, on September 20, on two men killed in an explosion at the laboratories of Monsanto Chemicals, Ltd., Cefn Mawr, Ruabon, on June 26, could offer no theory as to the cause of the explosion. Later laboratory tests under similar conditions failed to produce any explosive effect. A verdict of accidental death was returned on William Ward, process worker, and Richard Henry Biggs, foreman process worker. Mr. Maurice V. Evans, East Denbighshire coroner, said there was no evidence of criminal negligence.

Questioned by Mr. Hywel Jones (for the families of the dead men), Dr. E. M. Francis, head of the production section, said the cause of the explosion was still obscure. It was the first time he had made the particular experiment on a large scale. Replying to Mr. Daniel Bradin (for the Monsanto Company), Dr. Francis said the fullest experiment had been made to exclude all points of danger.

Another chemist, Dr. R. A. Baxter, described laboratory experiments after the explosion. Substances used had been treated under similar conditions, including a blockage under pressure, and they had been unable to produce an explosion. The substances were not in themselves explosive.

• HOME •

Wolfram Dearer

Prices of wolfram were again increased during the week. On September 20 prices ranged from 225s. to 285s. nominal a unit, c.i.f. compared with 220s. to 225s. on September 18.

U.K. Quicksilver

The price of quicksilver per flask of 76 lb. delivered U.K. was raised on September 25 to £23 10s. to £24 10s. compared with a previous quotation of £23 to £24 10s.

Tin Prices Firmer

Following an advance of about £20 on the London Metal Exchange on September 20, prices of tin remained firmer, with settlement at £788 in the closing session. Business was quiet on September 21, but on September 25 in the closing session turnover was 105 tons including 10 tons cash, settlement £807.

Scrap Iron and Steel Orders

Scrap alloy steel and stainless steel scrap is released from price control, but not from control of acquisition and disposal under a new Ministry of Supply order which became effective on September 18. The Iron and Steel Scrap Order, 1950, S.I. 1950, No. 1523 consolidates the Control of Iron and Steel (Scrap) Orders 1943-1950 and lists a number of price amendments.

Lorry Driver's Bravery in Calcium Fire

The I.C.I. industrial gold medal is to be presented to Mr. Harry Thornton, a Widnes motor driver, for outstanding bravery. On June 27, rain which had leaked into some aluminium drums of calcium on his lorry caused a fire at Gaskell Marsh Works, Widnes. Thornton drove his lorry to a safe spot and, ignoring the heat, unloaded the drums, thus preventing a serious works fire.

Bradford May Test TB Vaccines

The Medical Research Council has invited Bradford to participate in controlled clinical trials of the BCG and Vole vaccines for the prevention of tuberculosis. Approval of the request was recommended by the Health, Care and After-Care Committee of the corporation. Dr. V. P. McDonagh, deputy medical officer of health, states that these trials would probably involve at the outset children leaving secondary modern schools at 15, with regular examinations for three years. A start would probably be made in January.

Liverpool Site in Prospect

Kirkby Trading Estate, Liverpool, has been named as the possible site of a new factory for Albright & Wilson, Ltd., of Oldbury, Birmingham.

Standard Tin Price Adjustment

The computed average increase of the standard tin (99.75 per cent metal content) reference price of £600 a ton has been fixed at £80, the Ministry of Supply announced this week. This amount is payable to merchants who bought at £600 a ton before the devaluation of sterling.

Coal Production

Output of coal last week, both deep-mined and opencast, showed a small increase over the previous week. Comparative figures are:—Last week: 4,296,900 tons (deep-mined 4,053,300 tons, opencast 243,600 tons). Previous week: 4,199,400 tons (deep-mined 3,965,300 tons, opencast 234,100 tons).

Plastic Lens

The latest development in Nife, industrial electric lamps is the use of a new one-piece combined bezel and lens which is screwed directly onto the headpiece of miniature cap lamps used extensively in the mines. Moulded in optically pure Perspex, it is extremely strong and increases the lamp's candle-power by about 10 per cent, giving wide light diffusion.

Oil Imports Freed

Restrictions of imports of crude oil and petroleum products from soft-currency countries, or imported from British-controlled producing companies or refineries in any country, have been lifted. Open licences will be issued only for imports which require sterling not convertible into dollars or the currency of the exporting country.

New Quay for Iron Ore

A new 1000 ft. quay capable of berthing two iron ore vessels at once is being built at Bidston Dock, Birkenhead, by the Mersey Docks and Harbour Board. It will be used to supply Hawarden Bridge Steelworks at Shotton, Chester, where a blast furnace plant is being built, and will take ships carrying up to 12,000 tons of cargo. Discharge of the ore from ship to wagon will be by two electric transporter cranes with a lifting capacity of 18 tons. Deliveries of the ore from Bidston Dock are expected to begin in 1952, and the transporters will deal with at least 850,000 tons a year.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALUMINIUM REFINERS, LTD., Manchester. (M., 30/9/50). August 29, £5000 debenture to D. Daniels, London, general charge. *Nil. November 26, 1947.

F. A. BILLINGTON (CHEMISTS), LTD., Rowley Regis. (M., 30/9/50). August 31, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on property at Rowley Hill, Rowley Regis, and fixtures. *Nil. September 8, 1948.

CROSS & MAX, LTD. (formerly CROSS & MAY (AGENCIES), LTD.), London, E.C., dealers in chemicals, etc. (M., 30/9/50). August 24, assignment, securing, to Midland Bank, Ltd., any amount now due or to become due at any time from Cloister Laboratories, Ltd., to the chargees; charged on certain money. *Nil. December 31, 1949.

LEEDS CHEMICAL CLEANING WORKS, LTD., Bradford. (M., 30/9/50). September 1, £24,000 charge, to Heritable Securities & Mortgage Investment Association, Ltd., Edinburgh; charged on specified properties at Manchester, etc. *Nil. March 12, 1949.

LONDON CAPSULE CO. (1950), LTD., Croydon. (M., 30/9/50). August 24, £1000 second mort., to F. C. Ells, Angmering; charged on Empire Works, Mitcham Road, Croydon; also August 28, £4800 mortgage to London & Manchester Assurance Co., Ltd.; charged on Empire Works, Mitcham.

MERTHYR TYDFIL CERAMICS, LTD., Cardiff. (M., 30/9/50). August 31, debenture to H.M. Treasury Solicitor securing £10,000 not ex.; charged on specified lands at Merthyr Tydfil and a general charge.

Change of Name

The name of SIMMONDS PRODUCTS, LTD., has been changed to SPOSS PRODUCTS, LTD.

Company News

Ilford, Ltd.

The dividend on the 6 per cent cumulative preference shares of Ilford, Ltd., for the half-year ending October 31, is to be paid on November 1.

The Ketton Portland Cement Co., Ltd.

Net profit for the year ended June 30 of the Ketton Portland Cement Co., Ltd., was £71,332. A final dividend of 10 per cent on the ordinary shares plus 2½ per cent bonus has been declared, making a total of 17½ per cent for the year.

Lewis Berger & Sons, Ltd.

Dividend on the ordinary stock of Lewis Berger & Sons, Ltd., has been continued at 33 per cent.

Murex, Ltd.

Consolidated trading profits for the year ended April 30 at £905,494 were more than £30,000 larger than in the previous year. A final dividend on the ordinary stock of 6 per cent, making 10 per cent for the year, has been approved.

New Registrations

Agricultural Spraying Co., Ltd.

Private company. (485,956). Capital £100. Consultants and contractors for the prevention and destruction of pests, plant and animal diseases, and manufacturers of insecticides, fungicides, chemicals, etc. Subscribers: J. P. M. Morris, and J. E. S. Keyse. Reg. office: Houghton Hall, Cavendish, Suffolk.

Archanium Co., Ltd.

Private company. (486,029). Capital £100. To acquire the business of manufacturing chemists carried on by the Archanium Company at Ellenden, Sandhurst, Kent. Directors: G. Hayworth, and P. Nesfield. Solicitors: McMillan & Mott, 212 High Holborn, W.C.1.

Dow Corning, Ltd.

Private company. (486,170). Capital £100. To import, export, manufacture and deal in chemicals and chemical compounds (in particular chemical compounds of silicon whether combined with inorganic elements or with organic radicals or carbon-containing groups, organo-silicon compounds, and polymeric organo-silicon products such as silicones), etc. The first directors are not named. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

(continued at foot of next page)

Chemical and Allied Stocks and Shares

ACTIVITY in stock markets has reached its highest level this year mainly as an effect of the big demand for rubber shares, which took dealers by surprise and rapidly forced up prices. Although best levels have not been held, gains at the time of writing range up to over 10s. in £1 shares and small-priced 2s. shares record rises of over 50 per cent compared with a week ago. The prevailing view is that even if the price of rubber went back to 2s. 6d. lb. next year most companies would still earn good profits; while so long as the present level of over 4s. lb. is maintained there are prospects of materially increased dividends. The commodity price is now at its highest for 25 years, having reached slightly more than 4s. 8d. lb.

British Funds recorded moderate declines and industrial shares failed to hold best levels, mainly because buying interest for the moment is centred on Far East securities. Imperial Chemical came back to 42s. 7½d., but Fisons were firm at 27s. because of the good yield, assuming hopes of a 9 per cent dividend total for the year are realised. Albright & Wilson showed firmness at 30s. 3d. "ex rights" to the new 5 per cent preference shares which were up to 1s. 10½d. premium over the issue price at which they were offered to shareholders. Laporte Chemicals 5s. units were 10s. 6d., Brotherton 10s. shares again firm at 20s. xd., Monsanto 5s. shares at 51s., Boake Roberts 30s. 3d. Calor Gas 5s. shares were 20s. 6d. and Pest Control 7s. 6d. Lawes Chemical were 10s. 6d., Amber Chemical 2s. shares 2s. 9d., F. W. Berk 10s. 9d., Bowman Chemical 4s. shares 5s. 3d., and British Chemical & Biologicals 4 per cent preference 17s. 3d. Woolley 4¾ per cent debentures kept at 104½. William Blythe 3s. shares were 9s. 6d. xd.

The decision of Lever Brothers & Unilever to issue £10 million of 3¾ per cent debentures at 98½ created a good impression in the market, because this is a public issue, contrasting with the private placings made a short while ago by Imperial Chemical and the Distillers Co. The Lever policy is taken as a reflection of the much better conditions which have developed in markets over the past few weeks. Over-subscription of the issue is confidently predicted; the new debentures are a first-class investment and their interest requirements are covered more than 30 times. Lever's £1 units at 41s. 10½d. eased slightly because it has not been found possible to offer shareholders preferential terms of allotment in the new issue. Although profits of the English company may be lower, those of the Lever group as a whole are expected to be maintained.

Boots Drug have firmed up to 50s. 3d., Glaxo Laboratories 10s. units have been active around 49s. 9d. and British Aluminium strengthened afresh to 45s. 3d., Borax deferred were 55s., while, pending the results, British Celanese remained active around 24s. 9d. on higher dividend expectations. Nationalisation steel shares were again moderately lower owing to selling and exchanging into other securities. Elsewhere, Stavely were firm at 84s. 6d. awaiting the results. The 4s. units of the Distillers Co. have been active up to the higher level of 20s. British Xylonite were 82s. 6d., British Industrial Plastics 2s. shares 6s. 1½d. and De La Rue up to 25s. 6d. Oils were more active, with sharp gains in Anglo-Iranian and British Borneo Petroleum.

NEW REGISTRATIONS

(continued from previous page)

Glazebrooks (Holdings), Ltd.

Public company. (485,530). Capital £300,000. Manufacturers, importers and exporters of and dealers in oils, paints, dyes, etc. Director: E. C. Coverdale, Tattlebank House, Claverdon, Warwick. Reg. office: 20 James Road, Tyseley, Birmingham.

Huth & Co. (Industrial & Transport Developments), Ltd.

Private company. (485,444). Capital £25,000. Importers, exporters and manufacturers of chemicals, plastics, etc. Subscribers: E. H. Athanassoglou, White Ledges, St. Stephens Road, Ealing, W., and J. K. Stach, 35 Canfield Gardens, N.W.6. Reg. office: 67/70 Ibex House, Minories, E.C.3.

B. A. McCalla, Ltd.

Private company. (485,716). Capital £15,000. To acquire the business of a chemical, glaze and enamel manufacturer carried on by Bertram A. McCalla at Hanley, Stoke on Trent, and to carry on the business of chemists and potters' merchants, etc. Directors: H. A. McCalla and Mrs. H. E. McCalla, both of 25 Priory Road, Newcastle under Lyme. Reg. office: Bucknall Works, Bucknall Old Road, Hanley, Stoke on Trent.

Midland Silicones, Ltd.

Private company. (486,179). Capital £100. The objects and other particulars are similar to those of Dow Corning, Ltd.

Prices of British Chemical Products

Strong Markets and Rising Oxide Prices

WITH a fairly wide demand continuing both for home and export account, values throughout the industrial chemicals market remain steady, with a strong undertone. New bookings for the textile and plastics industries have been on a good scale, and consumers' specifications for deliveries against existing contracts have been to the full extent of commitments. Despite the strong markets, there have been no outstanding price changes other than the movements brought about as a result of the fluctuations in metal prices. There is an active demand for the potash chemicals and the barium compounds and inquiries for bleaching powder remain brisk. A good inquiry is reported from all sections of the coal tar products market and the price position remains firm.

MANCHESTER. — Firm price conditions, especially in regard to metal compounds, continue to be reported on the Manchester market for heavy chemical products. Bicarbonate of soda, soda ash and caustic soda, among the alkali products, are being taken up by home users in good and regular quantities, and a steady demand has been reported during the past week for a wide range of other chemicals. Shippers' inquiries have been fairly numerous. Moderate activity is reported in the market, fertiliser compounds being among the busiest sections. A brisk demand for cresylic acid (duty-free in America) is an outstanding feature of the tar products market.

GLASGOW.—The Scottish heavy chemcial market has been exceedingly quiet during the past week. Export business is reacting to the international situation and is extremely low.

Price Changes

Rises: Antimony oxide, copper carbonate, copper chloride, copper nitrate, red lead, white lead, litharge, magnesium carbonate, magnesium oxide, mercuric chloride, mercurous chloride, potassium iodide, tartaric acid, zinc oxide, ammonium sulphate, I.C.I. special No. 1 compound fertiliser.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £47 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£182 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4½d. per lb. Crimson, 2s. 6½d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£144 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£135 10s. per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—Manchester: 1s. 10d.-1s. 10½d. per lb.

Copper Chloride.—(63 per cent), d/d, 2s. 2d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63 per cent), d/d, 2s. 1d. per lb.

Copper Sulphate.—£56 10s. to £59 per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £108 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. Manchester: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—21s. per lb.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £146; orange lead, £158. Ground in oil: red, £166; orange, £178.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £153 10s. per ton. Ground in oil: English, under 2 tons, £170 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£146 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light commercial, d/d, £74 5s.; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light commercial, d/d, £187; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 8s. 5d.; smaller quantities dearer

Mercurous Chloride.—9s. 4d. per lb., (28 lb. lots).

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £63 10s. per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 15s. 5d. per lb.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—Manchester: 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb; anhydrous, 7½d. per lb., net, d/d U.K. in 7 8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. Manchester: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

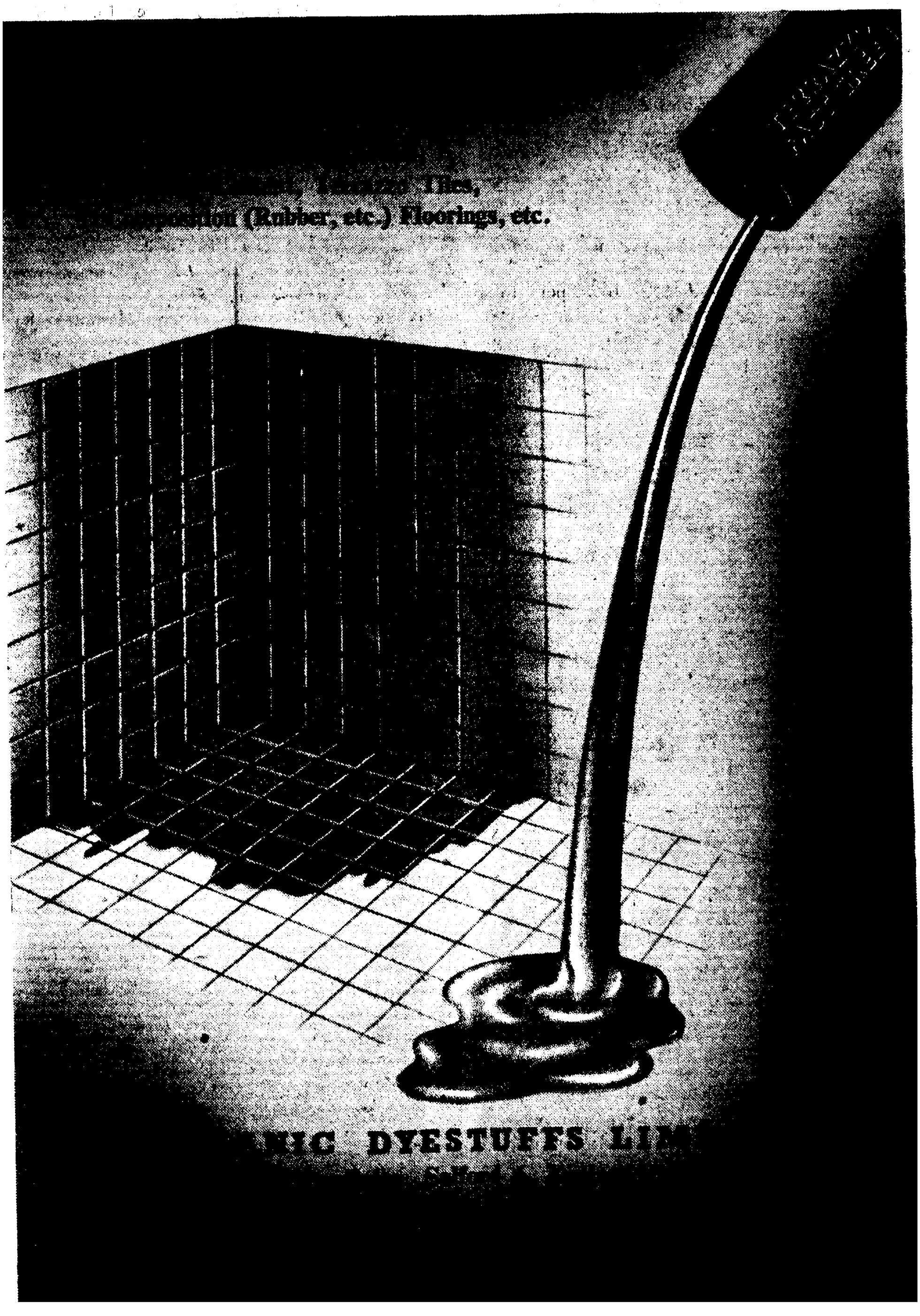
Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £139; green seal, £138; red seal, £136 10s.

Zinc Sulphate.—Nominal.


Tiles,
(Rubber, etc.) Floorings, etc.
DYESTUFFS

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb, according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 9s. 6d.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 17s. I.C.I. Special No. 1, £19 14s. National No. 2, £11 0s. 6d. per ton

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5½d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 18s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—Nominal.

***o*-Cresol** 30/31° C.—Nominal.

***p*-Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s 8½d. per lb

Dinitrobenzene.—8½d per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s

***p*-Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works

Nitronaphthalene.—1s 2d. per lb.; P.G 1s 0½d. per lb

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—2s 2d per lb., in casks.

***m*-Xylidine Acetate.**—4s 5d. per lb., 100%.

Latest Oil Prices

LONDON: September 27. The prices of all refined oils and fats remain unchanged during the eight-week period ending October 7. The prices of all unrefined oils and fats remain unchanged during the four-week period ending on September 30.

Light Metal Totals

MINISTRY of Supply statistics relating to U.K. production, imports and consumption of light metals in July include the following (in long tons):—Virgin aluminium: production 2285, imports 9822. Secondary aluminium: production 6641. Aluminium scrap arisings 7710, consumption 9459. Aluminium fabrication 17,927, foil 796. Magnesium fabrication 286. Production of virgin aluminium was slightly less than in July last year (2517), but imports were considerably less than last year's July figure of 24,820 tons.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

THE INSTITUTION of CHEMICAL ENGINEERS

EXAMINATION, 1951

Application forms, (returnable 1st December, 1950) and particulars of the Associate-Membership Examination for 1951 may be obtained from the Hon. Registrar, **INSTITUTION OF CHEMICAL ENGINEERS, 56, VICTORIA STREET, WESTMINSTER, LONDON, S.W.1.**

SITUATIONS VACANT

APPLICATIONS are invited by the Division of Atomic Energy (Production) for the following appointments at Windscale Works, Sellafield, Cumberland.

Post 1. **RESEARCH MANAGER** to take charge of a group of laboratories engaged on applied research work in connection with a wide range of new chemical processes associated with atomic energy development. Experience in organising and directing industrial research work is essential and experience in the chemistry of radio-active elements would be an advantage. Candidates must be at least 30 years of age.

Post 2. **ASSISTANT RESEARCH MANAGERS** to be responsible to the research manager for leading teams engaged on the applied research work outlined above. Experience in industrial research work is essential and experience in the chemistry of radio-active elements would be an advantage.

Post 3. **ASSISTANT DEVELOPMENT MANAGER** to be responsible to the development manager for leading teams engaged on semi-scale and pilot plant experimental work in connection with the development of new chemical processes. At least three years' chemical factory or industrial laboratory experience is essential.

Post. 4. **RESEARCH CHEMISTS OR PHYSICISTS** to undertake chemical and radio-chemical research work associated with atomic energy development. Experience in an industrial laboratory is essential for the higher posts and experience in the chemistry of radio-active elements would be an advantage for certain other posts.

Candidates must have either a first or a second class honours degree in chemistry, associateship of the Royal Institute of Chemistry or equivalent qualifications. Alternatively, for Post 3 they must have either a first or second class honours degree in chemical engineering, associateship of the Institution of Chemical Engineers or equivalent qualifications, and, for Post 4, either a first or second class honours degree in physics, associateship of the Institute of Physics or equivalent qualifications. Houses will be available within a reasonable period for successful candidates who are married.

Salary will be assessed according to qualifications and experience within the ranges *Post* 1. £1,420-£1,650 p.a., *Post* 2. £910-£1,177 p.a., *Post* 3. £720-£960 p.a., and *Post* 4. £670-£860 p.a. or £380-£620 p.a. Rates for women somewhat lower. Posts 1,2 and 4 carry F.S.S.U. benefits and successful applicant for Post 3 will be allowed to retain F.S.S.U. if already under the system.

Applications to **Ministry of Supply, D.At.En. (P), Risley, Nr. Warrington, Lancs.,** stating post applied for. Rs. 1942/25/IR/8.9.50

CHEMIST or **CHEMICAL ENGINEER** required with really good process experience. Applicants must possess initiative, and resourcefulness in a high degree. These qualities will command a good salary. Age 25/40. A contributory pensions scheme is in operation and help will be given in the housing problem. Apply: Personnel Manager, THE MIDLAND TAR DISTILLERS, LTD., Oldbury, Nr. Birmingham.

FOR SALE

APPROXIMATELY 45 cwt. **BENTONITE GRADE BX3.** Offers of purchase to Box C.A. No. 2951, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

CHARCOAL, ANIMAL and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hilljones, Bochurch, London." Telephone: 3285 East.

DOUBLE "Z" MIXER. Tilting pan, 48 in. by 36 in. by 30 in. Packed glands.
MORTON DUPLEX MIXER. "Z" blades, 2 speeds, 20-gallon size. Safety cover, with or without 5 h.p. 3-phase motor.
C.I. MIXING VESSEL, 3 ft. 6 in. diam. by 3 ft. 10 in. deep; bottom discharge. Ditto, 25 in .by 32 in.
"U" POWDER MIXER, self discharging; take 20 cu. ft. of material.
STAINLESS STEEL TANK, two compartments, each 250 gallons. With brine or steam coil in insulated jacket.
VELOX HORIZONTAL STERILIZER, 2 ft. 6 in. diam. by 4 ft. long, with steam coil. Quick-close door. All fittings.
MANLOVE SWAN-NECK HYDRO, 30 in. perforated cage
COPPER COATING PAN, jacketed, 28 in. diam.

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Tel.: 1010 and 1133.

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STAINLESS Steel Jacketed **BOILING PANS** and Mild Steel Jacketed **BOILING PANS,** all sizes up to 500 galls capacity. Can be fitted with stainless steel or mild steel stirring gear, motorised or pulley drive.

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MIXING VESSELS with stirring gear, various sizes, can be fitted with coil heater

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TWO—48 in. Broadbent **HYDRO EXTRACTORS,** all electric underdriven.
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FOUR Enclosed Jacketed Vertical **STEEL MIXERS** 4 ft. by 4 ft. deep.
Micro Twin Laboratory **REFINER W.C.** 9 in. by 6 in. by 4½ in. rolls, also 14 in. by 9 in. by 7 in. and 20 in. by 14 in. by 12 in.
Unused Jacketed **VACUUM OVENS** 8 ft. by 5 ft., 8 ft. by 4ft., 7 ft. by 4 ft. and 7 ft. by 3 ft. diam.
Stainless Steel **ELEVATORS** by "H. Carter" 19 ft. and 40 ft. centres.
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"Not for Publication"

OF the 50 million people in this country it is safe to say that many fewer than half a million have any conception of the size, nature or importance of the British chemical industry. There are a number of practical reasons why, even in 1950, this is so. A large proportion of the chemicals produced are never seen or handled by the general public; they are used as intermediate materials by the rest of industry. Secondly, there is still a deeply entrenched tradition of secrecy, a legacy from the past century when national competition in Europe was fierce and fearful and advances in methods or products were difficult to protect. This the "hush-hush" atmosphere is in some quarters still absurdly preserved, regardless of the fact that many of the closely-guarded "secrets" of chemical industry today are quite easily uncovered by any competent student of textbooks, journals, and patents. The ideal of full information can hardly thrive in an atmosphere of secrecy. A third reason is to be found in the fact that the chemical industry employs a very small number of people in relation to its great size and turnover; consequently, the volume of " inside information " which casually reaches the rest is minute compared with the flow that emanates from such industries as coal, transport, or building. The fourth factor is that chemical processes are not easy for the average person to understand, and a curious interest in the sensational is more easily stimulated than a balanced appreciation of what has been achieved.

All these reasons put together still do not represent a complete excuse for the industry's own lack of initiative in the field of publicity, or, to use the preferred modern phrase, of public relations. Indeed, the more difficult are facts and ideas to publicise, the greater is the need for effort. Only in recent years, however, have a few companies, which stand out as exceptions rather than typical examples, attempted to tell their own stories to the public. For generations the British chemical industry has preferred to hide its achievements within the fume cupboard. The assumption that virtue is always rewarded is unsafe in a competitive and clamorous age. Recent Parliamentary developments affecting the steel industry will suggest to some that explicit statements are wanted now of what chemical industries have done and are doing.

No one in his senses would compare the risks of State interference or nationalisation in the U.S.A. with the risks that have to be faced here.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s single copies, 9d ; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Throughout North America the idea of private enterprise commands support from an overwhelming majority. Yet the U.S. chemical industry is more active than any other in providing information about itself. The long-term value of publicity is understood and accepted at all levels.

"It becomes of the first importance that chemical manufacturers should get their story across to their employees, their customers, their stockholders, and the general public accurately and without delay. There is much evidence that a genuine desire for such information exists. To-day's public is showing greater interest than ever in scientific and industrial material in newspapers, magazines, and other educational media. And the chemical industry does have a tremendously worthwhile story to tell."

This is the conclusion offered in the (U.S.) *Chemical Industries* recently. It referred to the recent decision of the U.S. Manufacturing Chemists' Association to intensify its public relations work. In Britain, where the need for widespread public appreciation of what the industry is contributing to the maintenance and some advances of civilised living is more urgently required, it would be a gross exaggeration to speak of intensifying such activities. They are still almost imperceptible.

It is not suggested that the Anglo-American comparison should be pressed too far. The American man in the street is a more willing consumer of publicity. He expects to be sold an idea. The Englishman is exceedingly suspicious at the first sign of the process. To imitate American methods in detail could easily do as much harm as good. Methods used in this country require to be carefully chosen to suit the climate of public reaction. Meanwhile, in the absence of anything comparable with what is done—perhaps over-enthusiastically— in the U.S.A., in this country a "dog-with-a-bad-name" atmosphere attaches to the word "chemical". The reaction to a current proposal to establish a fairly large chemical factory in a West Country town was an apt example. While some opposition to any industrial project was to be expected, the prefix of "chemical" produced intense local opposition. Fumes, smells, and corrosive pollution of the atmosphere were immediately foreseen by those to whom the possibility that a modern chemical works could be clean and inoffensive would probably be news. The blame, however, does not rest on them. No one has told them. If the story was a dull one, this might be understandable. But the industry has a compelling story to tell, one which touches every home in the country. It is high time it was told.

Notes and Comments

Synthetic Detergents and Soap

THE laundry and trades' exhibition at Olympia, London, which ends to-day (October 7), gained particular interest from two circumstances: it was the first since the war—in point of fact, for 12 years—and the first since the advent of commercial synthetic detergents. The latter influence, coupled with the recent freeing of soap from rationing, has invited expert estimations of the competitive position of each. A spokesman of one well-known firm which makes both soap and synthetic detergents gave his opinion, to THE CHEMICAL AGE, that even in the novel condition of ample soap supplies, synthetic detergents will at least hold the place they have won. That, he considered, could be taken as a certainty in the hard-water areas. That moderate view of soapless detergents' prospects was fairly widely corroborated, although no one is prepared to assign proportionate figures to the future distribution between soap and synthetic detergents. In American statistics a figure of 25 per cent of the whole sales of soap and soapless detergents has been assigned to the synthetics—principally the petroleum based ones. The determining factor, there, however, is the cheapness which native petroleum and a vast refining industry have promoted. An approximate parallel may one day exist here, when the new refining industries have emerged completely from their chrysalis stages. It is clear, however, that, short of some fundamental advance in the technology of the synthetics—which is not foreseen here or in America at the moment—the ascendancy of soap and soap-based detergents for particular uses will not be undermined.

Research Favours Soap

A FACTOR which is capable of having an important influence on the future usage of soap or synthetics is the policy reached by the British Launderers' Research Association, on which prejudice favouring the traditional methods is unlikely to have had any effect. The view of the research group is that for laundering as a whole and the associated detergent jobs the choice must continue to be soap. A spokesman of the research people says it has been "scientifically established" and proved in practice that at present there is no compound produced in quantity which is as complete or as good a detergent as soap. This statement might, he said, have to be modified in years to come—but not yet. The efficacy of some of the newer synthetic detergents for specific purposes, such as cleaning greasy overalls and other garments, is not denied. It is claimed, however, that this can be done quite as well by soap—preferably in nascent form. The question of soap *versus* synthetic detergents seems likely to resolve into a study of availability of materials and cost. Nascent soap, for example, seems likely always to be more expensive than the synthetic substitute. The host of exhibitors at the laundry exhibition offers an interesting commentary, if inconclusive, on the activity of the groups. There were stands of 10 makers of soap and soap products only, four of firms which make both soap and synthetic detergents, and five exhibits of concerns making only synthetic detergents.

DSIR—Co-ordinator

NONE of the many claims of benefits conferred on science and industry which could be made on behalf of the DSIR would surpass its special services as a co-ordinator of research effort in fields too diversified to have found a congenial meeting ground. That is affirmed once more in the work of one of the principal departments, the National Physical Laboratory, whose current report shows that in metallurgy, as in the other 11 divisions,

private firms as well as the specialist research associations are accepting more fully the principle of sharing work and information in common fields of research. One of the principal contributions of the DSIR metallurgists has greatly advanced the possibility of establishing accurately the mechanical properties of pure iron alloys. They have resolved the problems of production in quantity of pure iron (99.96 per cent) to the extent of producing 40 lb. weekly. That research involved some important advances by the analysts, such as a method for determining trace impurities which can probably reveal aluminium with ± 0.0005 per cent accuracy. Commercial alloy practice and the availability of some of the less common metals and derivatives, such as titanium and vanadium, will gain important advances from some of the work described in the chemistry section report. This review, unfortunately, covers only research in 1949. It certainly heightens the desire to hear the further development of those themes in the 10 months of the present year.

Two Kinds of Chemical Warfare

BECAUSE they hold prospects of far reaching benefits to some chemical producers and large sections of agriculture the antecedents of the systematic insecticides are seldom given much thought. Material benefits and the urgent need to find safeguards that will ensure that the lethal effects are confined to insect populations have further diverted attention from the early work on which the present formulations have been built and the circumstance that one important stage in that work was significantly linked with the first fearful experiments in chemical warfare—the war gases prepared by Germany in the first World War. That perversion of the original work of the German, Michaelis, during 1890-1915 was not foreseen by the author of it, who wrote of the basic knowledge of organic phosphorous compounds which he uncovered. quite disinterestedly: "Even if at this moment no special possibilities are apparent yet, there will, of that I am sure, be a future for this subject surpassing even its great past." How authentic was that prophecy has been recalled by B. A. Kilby in an able short review—in "New Biology", which Penguin Books are issuing later this month—of the development of the organic phosphorus drugs and insecticides, to which he was one of the contributors.

Plant Reactions

KILBY does not conceal the debt which is owed to German chemistry, principally in the person of Gerhard Schrader, of the I.G. laboratories at Leverkusen, in uncovering the insecticidal possibilities of organic phosphorus compounds and fluorophosphonates. One of the most decisive results was the German group's proof that plants will take up through the roots or foliage the toxic material by which the sap is rendered poisonous to predators, without damage to the plant. The energy with which the translocation principle has been exploited by chemists here and in the U.S.A.—Pestox III and Parathion are familiar examples—is continuing to produce important results. The latest, apparently belonging to that category, has made its appearance in Pittsburgh, U.S.A., under the style of E1059 (Parathion was E605), or Systox, developed from the synthetic octa-methyl pyrophosphoramide. Test results appear to show that the lethal factor has been much increased, yet it is said to be not more toxic to men than Parathion and to have longer persistence in plants than its predecessors. This branch of research is, incidentally, affording some curious and important facts about plant biology, likely to have a useful bearing on further progress in systemic poisons. The Systox studies, for example, disclosed in the course of grafting experiments that this insecticide spreads through a plant almost entirely upward and outward from the point of application. An untreated graft on treated stock becomes toxic, but a sprayed graft will not communicate its insect poison to the rest of the plant.

EXTENSION OF *p*H SCALE

New U.S. Standards

THE U.S. Bureau of Standards has announced four new *p*H standards intended to provide fixed points of reference at the upper and lower limits of the standard *p*H scale. The new standard solutions have been developed so as to extend the accuracy of the three middle-range standards at present distributed by the Bureau.

These standards of *p*H 4, 7, and 9 were originally conceived with the intention of establishing a universally accepted scale of acidity. Up to now, however, the *p*H of intermediate points has had to be obtained by interpolation and, because the scale is not uniform at its upper and lower limits, there has been need for new reference standards for highly acid and highly alkaline solutions. The four new standard substances now adopted are:

1. A mixture of sodium bicarbonate and sodium carbonate, both of 0.025 molar concentration; *p*H of about 10 at room temperature.
2. A 0.01 molar solution of tri-sodium phosphate; *p*H 11.7 (approx.).
3. A saturated solution of potassium hydrogen tartrate; *p*H 3.6 (approx.).
4. A 0.01 molar solution of potassium tetroxalate; *p*H 2.1 (approx.).

It is considered that present inaccuracies at these ranges will be considerably reduced, and in some cases eliminated, but the measured *p*H of solutions that are excessively acid or alkaline will still be uncertain to the extent of ± 0.03 unit.

Croda in the U.S.A.

A FURTHER example of the policy of some British chemical companies of establishing subsidiaries in the U.S.A. was supplied last week in an announcement by Croda, Ltd., of Goole. It disclosed that next month Croda, Inc., will be formed in the U.S.A. and will set up plant for the manufacture of Hartolan wool wax alcohols, one of the specialities of the parent company.

It is hoped to embark upon the manufacture of all other Croda products as soon as possible. These will be of the kinds for which there is a large demand in the U.S.A. from the cosmetic and pharmaceutical industries, manufacturing chemists, heavy chemical manufacturers, paint manufacturers, etc.

Mr. F. A. S. Wood, a director of Croda, Ltd., and the son of the former managing director, is going to the U.S.A. at the end of October to establish the company.

NEW GPO LABORATORIES

Testing Unit at Birmingham

RECOGNITION of the GPO's increasing need for the services of analytical chemists to regulate the purchase and effective use of a host of materials was seen in the opening at Bordesley Green, Birmingham, on October 4, of a new block of analytical laboratories.

It is to serve the GPO tests and inspection department and will employ at the start some five analytical chemists and about 25 other chemistry workers in four main laboratories, mainly concerned with inorganic materials and especially metals. Later, these laboratories will collaborate in the organic chemical work for which at present the London chemistry department of the GPO is responsible.

The GPO centre, like many of its large industrial equivalents, will serve incidentally as a training ground for a substantial junior staff, all of whom are required to take the London external B.Sc. at a given stage in their service there.

The new block, covering 10,000 square feet, is very fully equipped with advanced equipment, especially for spectrographic studies of metals.

The principal guest at the inaugural function this week was Mr. F. O. Barralet, formerly chief chemist to the GPO, in which he had served for some 40 years. He began work in the London research section, served in the Dollis Hill Laboratories and was prominently associated with the plant inspection and testing department for a further 15 years.

Prospects of British Silicones

THE approaching prospect of manufacturing here silicone products, whose availability has been limited by the fact that most originate in the U.S.A., is mentioned by Albright & Wilson, Ltd. in an announcement relating to the formation of Midland Silicones, Ltd., in collaboration with the Dow Corning Corporation of America as a selling and technical service group for the U.S. products (THE CHEMICAL AGE, 63, 478). The announcement states that, in the near future, when Albright & Wilson begin manufacture in England, the new company will act as selling agents for the English products, and the shortages imposed by restrictions on dollar imports will be entirely overcome. It is hoped that both export and home markets will benefit. The directors of Midland Silicones, Ltd. include members of both the English and American companies.

AUGUST IMPORT LEVELS

Chemicals Rise to £3.1m

ALTHOUGH there were declines in a number of individual items, imports of chemicals, drugs, dyes and colours in August totalled **£3,133,527,** more than double the value of the same month last year, and **£461,520** more than in **1948.**

Decreases occurred in chemical machinery, the potassium compounds and sulphur. Among the more notable increases were: sodium compounds **£102,914 (£60,511)**; and carbon blacks **£359,108 (£104,516).**

	August, 1950	August, 1949
	Cwt.	Cwt.
Acetic anhydride	9,298	4,805
Acetic acid	—	—
Boric acid	400	6,400
Carbolic acid	2,511	—
Value of all other sorts of acid	£63,239	£66,773
	Cwt.	Cwt.
Borax	18,000	24,001
Calcium carbide	—	—
Cobalt oxides	402	625
	Tons	Tons
Fertilisers	—	205
	Lb.	Lb.
Glycol ethers and glycol ether-esters	503,176	96,609
Iodine	136,736	—
	Cwt.	Cwt.
Potassium chloride	709,574	674,788
Potassium sulphate	10,220	32,560
All other potassium compounds	6,373	5,235
Value of all potassium compounds	£518,368	£557,395
	Cwt.	Cwt.
Sodium nitrate	—	39,880
All other sodium compounds	19,083	11,155
Value of all sodium compounds	£102,914	£60,511
Chemical manufactures, etc. all other sorts		
Value	£1,019,997	£280,518
Dyes and Dyestuffs—	Cwt.	Cwt.
Synthetic organic dyestuffs	2,010	846
Extracts for dyeing	1,726	1,535
Extracts for tanning (solid or liquid)	134,266	31,982
All other dyes and dyestuffs	194	533
Paints and Extenders—		
Earth colours (except black)	21,588	13,641
Carbon blacks from natural gas	85,348	32,044
Value of carbon blacks	£359,108	£104,516
	Cwt.	Cwt.
Other, including vegetable, lamp, acetylene and bone black	18,086	3,808
Value of paints and extenders	£497,996	£179,136
Value of chemicals, drugs, dyes and colours	£3,133,527	£1,566,361
	Lb.	Lb.
Essential oils (other than turpentine)	546,365	420,112
Value of essential oils	£481,968	£309,817
	Lb.	Lb.
Synthetic oils	7,267	5,112
	Cwt.	Cwt.
Mineral jelly	20,617	15,698
Wax, petroleum, paraffin wax	74,730	30,008
Value of oils, fats and resins	£10,424,649	£8,507,859
	Tons	Tons
Sulphur	35,171	44,002
Value	£357,744	£368,087
	Cwt.	Cwt.
Gas and chemical machinery	1,177	22,093
Value	£34,303	£253,166
	Cwt.	Cwt.
Plastics materials	16,770	13,623
Value	£486,896	£327,153

WORKS SAFETY

A "Must" for Chemical Engineers

NEARLY **250** representatives of the chemical industry attended the third Chemical Works Safety Conference held at Scarborough from September 29 to October 1. In his opening address Professor G. M. Newitt, president of the Institution of Chemical Engineers, emphasised the value of introducing a study of safety measures at an early stage in the training of chemical engineers. He suggested that parties of students should be allowed to visit chemical works in order to study firms' safety measures. Three of the several papers presented at the conference were "Fire Hazards and Precautions in the Petroleum Industry" by E. E. Chanter, of Shell, Ltd.; "Fire Hazards and Precautions in the Manufacture and Use of Solvents" by J. Howlett, of the Distillers Co., Ltd.; and "Investigation of the Causes of a Fire" by Dr. J. B. Firth, of the N.W. Forensic Science Laboratory.

The conference was organised, as in the past, by the Association of British Chemical Manufacturers and the Royal Society for the Prevention of Accidents.

Fatal Accidents Increase

DEATHS from industrial accidents in the United Kingdom, showed a sharp increase in August. The total of 141 compares with revised figures of 120 in the previous month, and 132 in August, 1949.

Only four fatal accidents were associated with the chemicals, oils, soaps and kindred industries. Metal conversion and founding accounted for six and other metal trades one. There was one death in the group concerned with textile printing, bleaching and dyeing, while clay, stone, cement, pottery and glass accounted for two and gas works two.

Cases reported under the Factories Act or the Lead Paint (Protection against Poisoning) Act, 1926, in August, numbered 49, but there were no deaths. The incidence was as follows:—

Lead poisoning, seven; (shipbreaking, one; vitreous enamelling, two; electric accumulator works, one; other industries, one; painting of buildings, two); other poisoning (aniline), one; anthrax, two; epitheliomators ulceration (skin cancer) 30 (pitch, 17; tar, 11; oil, two); chrome ulceration, nine (manufacturing of bichromates, three; chromium plating, five; other industries, one).

Coal Production Level Maintained

Output of coal for the week ended September **30** was **4,242,000** tons. This was the sixth successive week that production in U.K. mines has exceeded **4** million tons.

GROWING OUTPUT OF ANTIBIOTICS

The Contribution of Mechanised Packaging

IN the past few months, considerable reorganisation has been carried out in the penicillin secondary production plant of the antibiotics unit at Barnard Castle, Co. Durham, resulting in increased productivity and a substantial saving of labour. This satisfactory state of affairs has been brought about partly through a progressive policy of packaging mechanisation and partly through schemes which Glaxo Laboratories, Ltd., has formulated with much expert knowledge of the problems for the speedy handling of materials

Originally a team of packing belt operatives (one chargehand and 17 assistants) was able to handle between 13,000 and 15,000 vials a day, but they were restricted in output on two counts. First, the old semi-automatic labelling machines, while performing good service, were limited to handling on an average only 27 cartons a minute and, secondly, following the labelling operations, the packing teams were required to perform a number of manual operations, which were markedly time-absorbing. Today the packing floor is being rapidly converted to automatic units, and the output of each line is now 65 cartons a minute, with a daily output of over 25,000. Two major contributions to this increased productivity have been the installation of completely automatic labelling machines and ingenious cartoning equipment which automatically handles corrugated liners, vials and leaflets.

Automatic Sealing

Penicillin cartons now leave the packing belts in attractive sleeve packs and thence go to newly installed fully automatic cellophane wrapping machines. On these machines the packs are completely sealed in cellophane at the rate of 30 a minute—an astonishing improvement over the old manual methods, which produced an average of three a minute. The assembling of packing materials in a store adjacent to the packing floor to permit of easy accessibility and the operation of a system allocating each batch of penicillin to its own packing team, are important aids to the general efficiency.

This general acceleration serves a need additional to the national need of increased productivity. It has a specific, local urgency. The Barnard Castle secondary production unit has recently been called upon to handle not only the whole of the penicillin output from its own primary

By courtesy of Glaxo Laboratories, Ltd.

One of the accelerated processes at Barnard Castle

production section but to accept also the growing production from its sister antibiotics plant at Ulverston.

The other units in the secondary production block, operating with similar efficiency and as part of the drive for maximum handling capacity, are working to an ingenious "flow-line"—or belt—system, beginning, logically, with the vial and bottle washing section. Here, in a large, yellow-tiled room, with fluorescent lighting, inverted vials and bottles are inspected for chips and cracks and then thoroughly washed on semi-automatic machines. Cleansing is by detergent solution, followed by clean water wash, and the subsequent rinsing is by distilled water from high pressure jets. The containers remain in sterilising ovens for four-and-a-half hours at 150° C. Rubber bungs are simultaneously washed in household washing machines, rinsed in distilled water, drained and centrifuged, and are sterilised in steam autoclaves (rubber bungs would perish in the extreme dry heat needed for sterilisation). Finally the bungs are left to dry in a hot air oven. Sterilisation of all the machine parts likely to come in contact with penicillin is carried out in autoclaves in this department and, beforehand,

(continued at foot of next page)

The Largest Injection Moulding Machine?

Wide Range of Industrial Products Possible

THE injection moulding plant installed at the A. L. Hyde works at Grenloch, New Jersey (shown here) is claimed to be the largest machine of this kind in the world. Designed and manufactured by the Watson-Stillman Co., New Jersey, it is capable of pressing out at one time thermoplastic products weighing approximately 200 oz. This compares with plant originally installed by the Hyde company 18 years ago which could injection mould plastic products weighing only one ounce.

The new machine, which weighs 115,000 lb., is operated by a 60 h.p. motor and has a nozzle pressure of 21,000 p.s.i. Overall dimensions are: 24 ft. 8 in. long; 5 ft. wide and 12 ft. 11 in. high. The size of the platen is 60 by 40 in. and there is a 54-in. daylight opening. The hopper holds 300 lb. of plastic materials and the clamping capacity is 1000 tons.

The increased capacity of this new equipment—a 60-oz. injection machine was formerly the largest—will enable a far wider range of industrial and commercial products to be manufactured. Among the promising current uses of such plant is the production of exceptionally large refrigerator and radio components.

GROWING OUTPUT OF ANTIBIOTICS

(*continued from previous page*)

care is taken to ensure that each part is wrapped in glacine paper. When required for use the machine parts are installed under aseptic conditions. Demineralising of the water used in the washing unit is carried out in this department.

Inside the filling hall a new type of filling machine is being used with marked success. Penicillin is fed from a hopper through finely adjusted worm feed which delivers a specified quantity of the drug to each vial. Careful statistical control of the weight of penicillin delivered to the vials necessitated by variations in the bulk density of the drug. To avoid undue compacting of the material an operator-controlled vibrator maintains a steady flow of penicillin into the hopper. Every machine in the filling hall is capable of handling up to 7,500 vials a day.

When filling operations are complete, rubber bungs are fitted aseptically. From the dry filling hall the trays of vials go for sealing and capping on multihead sealing machines.

U.S. Helium Plant Re-Started

Steadily increasing demands for helium for military and civilian uses has caused the U.S. Bureau of Mines to reopen its Amarillo, Texas, helium plant for limited production. Production was suspended in August, 1945 after a decline in military demands. During the fiscal year 1950, industrial consumption reached 63.8 million cu. ft. of helium and the estimates for the current fiscal year indicate that about 80 million cu. ft. will be needed.

DETERGENTS FOR THE LAUNDRIES

Growing Dependence on Chemical Aids

THE scientific side of modern laundering was well represented at Olympia, London, this week at the first Laundry, Dry Cleaning and Allied Trades Exhibition held since the war. The exhibits of the British Launderers' Research Association illustrated many of its activities, including some of its research.

Apparatus shown included that used in an investigation of the fundamental problems of soil removal and soiling re-deposition in washing processes. This has been developed with the object of evaluating detergents by quick laboratory tests instead of prolonged laundry trials. The actual removal of soiling was demonstrated with the aid of a projection microscope. The procedure was demonstrated which has been developed for this laboratory evaluation of detergency in which soiled chopped-up fibres replace the orthodox soiled fabric test pieces. The reproduceability obtained is ± 5 per cent.

Valuable Sodium Products

Among the exhibits of manufacturers of chemicals, that of ALBRIGHT & WILSON, LTD., showed some of the applications of Calgon (sodium hexa-metaphosphate) in the laundry industry. It gave practical demonstrations of its effect in the laundering of towels, showing how Calgon disposes of lime soap. A profile projector compared threads rinsed in the sodium chemical with others on which lime soap had been deposited.

Sodium metasilicate, stated to be used by two laundries out of three, was notable among the chemical supplies exhibited by ALCOCK (PEROXIDE), LTD. Chemicals for shower-proofing, moth-proofing and re-texturing of fabrics were the specialities shown by CATOMANCE, LTD. On the stand of HARDINGS (PENDLETON), LTD., attention was called to Harcolex, an emulsion of fatty acids specially adapted for the processing of heavily soiled work. Straight fatty acids of various titres were also shown.

LAPORTE CHEMICALS, LTD., offered a representative selection of its detergents and auxiliary products for the laundry washroom, including the standard builder Escolite, the various Escolite soap blends, and the several synthetic detergents for use in hard or soft water.

IMPERIAL CHEMICAL INDUSTRIES, LTD., Dyestuffs Division, had a full display of detergents, water-proofing agents, dyestuffs, stiffening agents, polishes for collars, and mildew inhibitors.

The principal exhibits of SHELL CHEMICALS, LTD., were Lensex detergent products, of which practical demonstrations of ready solubility, instant wetting and non-gelling were given. The non-gelling quality obviates the pre-heating of stock-tanks. Among the specialities exhibited by S. & D. CHEMICAL MANUFACTURING CO., LTD., were various soaps and wetting agents and Puropol " S ", a special sulphonated castor oil for use in hard water.

Most of the well-known soap manufacturers were exhibiting, including some which also manufacture petroleum-based and other synthetic detergents.

The GAS COUNCIL'S stand, illustrating the latest gas and coke-fired appliances designed for laundries and dry-cleaning establishments, stressed the value of the cleanliness of gas as a fuel. Unfortunately, some of the exhibitors relying on this source of heat were badly hit by the gas strike and had to abandon their demonstration plans.

The Rising Cost of Solvents

INCREASES in the prices of many derivatives, recently forecast by Mr. H. J. Ross, in view of the large rise in molasses prices, were announced on Monday. The new prices announced by the Distillers Company group show the following increases:

Plain British spirit, 4d. per proof gall. for all grades; methylated and other denatured spirits, 6½d. per bulk gall. for all grades; Glacial acetic acid (per ton), £11; all other grades, £8; acetic anhydride, £8; methyl acetate, £7; ethyl acetate, £10 10s.; isopropyl acetate, £12 10s.; butyl acetate £12; amyl acetate (BSS and technical), £8; butyl alcohol, £7 10s.

Kemball Bishop & Co., Ltd., on Monday notified a rise in the price of citric acid to 1s. 7d. lb., less 5 per cent, for 5 cwt. lots.

Notifications of price increases on an equivalent scale affecting about 30 solvent materials were also notified this week by A. Boake, Roberts & Co., Ltd. These range from £8 per ton for 80 per cent acetic acid to £27 more for di-acetin.

AMERICAN PACKAGING METHODS

Increasing Use of Thermoplastic Containers

THE standardisation of container types to cut forwarding costs and the help given by abundant plastics container materials and technology were some of the main points stressed in the productivity report on "Packaging" made by a specialist team which visited the U.S.A. earlier this year.

The report, published this week by the Anglo-American Council on Productivity, also calls attention to the greater use of power and mechanical equipment in the U.S. factories than in the British counterparts. Members of the team were much impressed by the U.S. workers' co-operative attitude towards new methods, incentive schemes and mechanisation. Such equipment had markedly raised the output of the American worker, although he did not have to work any harder.

Materials Used

The productivity team, although concerned with packaging methods rather than materials, made a fairly full survey of the wide development in the U.S.A. of plastics packaging materials. It noted the following plastics in use for packaging:

Thermosetting: Phenolics, ureas, melamines. Thermoplastic: Acrylics (Perspex), cellulose acetate, cellulose acetobutyrate, ethyl cellulose, polyvinyl chloride and vinyl copolymer (chloride-acetate), polyvinylidene chloride (Saran), polyethylene, polystyrene, rubber hydrochloride (Pliofilm).

In addition, the use in packaging of several other plastics, namely, nylon, S-polymer (styrene, isobutylene co-polymer) is being examined.

The six main applications of plastics in packaging were as film, in fabricated containers, as moulded containers, closures and coatings and in adhesives.

Cellulose acetate (from 0.005 in. to 0.021 in. or thicker) is the material mainly used for fabricated plastic containers. Shape and design are similar to those available in this country, but interesting developments are taking place in the methods of fabrication.

For rectangular and cylindrical containers, automatic and semi-automatic methods have been developed for fabrication up to speeds of 1000 per hour—with a consequent reduction in cost. Machinery for edge beading (both internal and external) is available. Folding boxes are being made from cellulose acetate.

There is an increasing use of thermoplastics for moulded containers: polystyrene, cellulose acetate, cellulose acetobutyrate, polyethylene, the vinyl resins and the acrylics (Perspex) all being used.

Because of the greater availability of the resin, polystyrene containers are more common in the U.S.A. than in Britain, and are used not only for the packaging of luxury goods, but also for everyday articles. Polystyrene has many attractive features as a packaging material (comparatively low cost in the U.S.A.), good transparency and good finish. A special shock-resistant polystyrene has recently been announced which it is stated will overcome the inherent brittleness of the normal polymer.

Polyethylene (polythene), a British discovery, is enjoying a wide use in America as a packaging material in the form of film, tube, coatings and closures, as well as for moulded containers. It is chemically inert, non-toxic, odourless, tasteless, has good resistance to the penetration of water vapour and liquid water, and is flexible.

These properties render it suitable for a wide range of packaging applications, while its flexible properties enable it to be used for the manufacture of "squeeze bottles," for packaging and dispensing powders (insecticides, etc.) and liquids (sprays, etc.). Plant for making this type of container is operating in this country.

Cost of Polyethylene Bottles

The cost of polyethylene bottles in the U.S.A. is about 2½-5 times that of glass: in Britain the price ratio is about 10-1.

Rigid bottles made from polystyrene and cellulose aceto-butyrate are not being used in any large quantity.

Closures used in the U.S.A., so far as the thermosetting plastics are concerned, are similar to those in Britain. Phenolics, ureas, and, to a less extent, the melamine resins, are used.

A number of interesting applications of polyethylene as closures were seen where advantage could be taken of its flexibility, for example, "hinged" closures and, for a metal drum, a spout which after used could be pushed back into the drum and covered with a metal cap.

Plastics were also being used in some of the newer adhesives which have quicker setting properties, firmer adhesion, increased resistance to water, and less tendency to attack by moulds and insects. Polyvinyl acetate is used in many of the newer emulsion type adhesives and some

of the hot melt cements contain vinyl resins.

The problem of finding a satisfactory ink for use on polyethylene was said to be on the way to being solved.

The team considered it significant that polyethylene is favourably priced as compared with Pliofilm and only fractionally more expensive than moisture-proof transparent cellulose, and cellulose acetate films. This fact accounts for the wide use of polyethylene in the U.S.A. The qualities which give the material its popularity are a lower water vapour transmission rate than all the other films except Saran (twice the price) and complete flexibility at sub-zero temperatures.

Great Future for Polyethylene

Observations in chemical industry show that polyethylene film has a great future. Already it is used as a liner for fibre drums and similar applications, thus facilitating re-use; there is no contamination of the drum and caking of hygroscopic substances is prevented. For viscous commodities the contents of a bag or liner can be squeezed out to avoid waste through adherence to the inside of the container.

The film produced in America is not as clear as the British product because of a difference in the basic molecular weight. Most converters of the film extrude it themselves in both tube and flat sheet form from the granule.

With the general abundance of raw materials for packages in the United States, the glass container meets considerable competition. Weight and space factors are also important.

Glass and Fibre

In the pharmaceutical field, the use of type 1 glass ("neutral" glass, or glass of high chemical durability) is restricted to containers for liquid injection products, and even here the use of type 3 glass (ordinary good quality soda-lime) is increasing. For example, penicillin products have been packed in type 3 glass vials by one pharmaceutical firm for several months, with complete success.

The use of type 2 glass (ordinary soda-lime glass sulphured in the lehr to improve chemical durability) was stated to be small and decreasing.

Wide use is made of solid fibre drums. The basic material is pure, unbleached, kraft paper, convolute wound. These drums are rapidly replacing the wooden cask, which is uneconomical to store owing to its shape and is affected by changes in humidity.

During a visit to a chemical manufacturing plant, it was observed that a patented fibre drum, embodying a toggle-operated steel closure, was used for the intake and storage of bulk supplies of powders. For the despatch of smaller quantities of products, a complete range of all-fibre drums was used, some constructed to suit the special requirements of the commodity, for example, with water vapour permeability barriers and liners. Loose, flexible polyethylene bags are placed inside these fibre drums, forming a container for pastes and greases. The bags are sealed by tying round the neck, the lid is placed in position and sealed with an adhesive tape containing glass-fibres.

The British team was under the leadership of Mr. G. M. Ashwell (Imperial Chemical Industries, Ltd., with Mr. A. F. Cowan (Metal Box Co., Ltd.), as secretary and included the following members: Mr. W. A. G. Pugh (Cascelloid, Ltd.), Dr. G. L. Riddell (Printing, Packaging & Allied Trades Research Association), Mr. J. H. Singer (Glaxo Laboratories, Ltd.).

Among the sponsors of the team were: the Institute of Packaging, Association of British Chemical Manufacturers, British Plastics Federation, Printing, Packaging and Allied Trades Research Association and the Glass Manufacturers' Federation.

To make widely available the results of their investigations in the U.S.A., members of the team attended an exhibition of packaging samples at the Waldorf Hotel, London, W.C.2, on October 5, which included specimens they had brought back from the U.S.A., and answered questions on American methods. The display and the discussion were sponsored by the Printing and Allied Trades Research Association.

Leather Chemists' Conference

THE importance of the work of technical committees was stressed by Mr. G. Jessup Cutbush during his presidential address to the annual general meeting and conference of the Society of Leather Trades' Chemists held at the University, Leeds, last month.

The president announced that the Donald Burton Prize for 1950 had been awarded to Dr. D. G. Roux, of the South African Section, for his paper on "The Purification of Black Wattle Tannin and Its Effects on Combustion Analyses."

The healthy financial position of the association was indicated by Dr. D. Burton (hon. treasurer), whose proposal that a Society of Leather Trades' Chemists Scholarship and Research Fund should be formed was approved.

During the two-day conference six technical papers, including the Fourth Procter Memorial Lecture by Professor E. K. Rideal, F.R.S., were read and discussed.

Packaging Petroleum Equipment

A Specialist's "Ten Commandments"

REQUIREMENTS of the petroleum industry overseas are not confined to highly specialised petroleum equipment. They embrace practically every kind of industrial, mechanical, electrical and scientific equipment, and may include the many other things needed to create and maintain the townships and ports associated with the oilfields. The packaging problems presented by such a wide range of goods for long-distance journeys are accordingly very exacting.

"Ten good commandments," which should be borne in mind to procure the safe despatch and delivery of equipment were given by Mr. J. Evan Cook to members of the Council of British Manufacturers of Petroleum Equipment when they visited, last week, the Peckham and Surrey Docks packing plants of Evan Cook's Packers, Ltd.

His axioms were these: (1) Deliver the machine to the packer clean and rust free. (2) Don't paint over rust in your own shops; hiding corrosion won't prevent it spreading. (3) Don't assemble precision surfaces together without first cleaning and treating with a corrosion inhibitor. (4) Protect the product from contamination by dirt, dust, damp and finger-prints while awaiting packing. (5) Secure every product in a manner that prevents all movement within the case. (6) Secure every component part of a product which could possibly break off or easily break loose. (7) Insert padding between castings and other damageable or corrodable components and the wood members of the packing case. (8) Insert anti-crush stretchers. (9) Line the case with waterproof material. (10) Build the case to fit the product after dismantling as many protrusions as possible to save shipping space.

A further piece of advice was that more consideration should be given to simplify all-welded structures that cannot be dismantled. In many instances the job consisted of "four legs surrounded by 90 per cent air," for which the shipping company charged the same rate as if it contained something useful.

This, said Mr. Cook, was a high price to pay for shipping legs. Wherever possible, detachable legs should be supplied which could be packed somewhere else in the case at half the shipping price.

Iron Catalysis in Fuel Research — Use of Radioactivity

FUEL chemists in the U.S.A. have been using alcohol, rendered radioactive, to reveal fundamental facts relating to the production of petroleum by synthesis from coal. This research, by the Mellon Institute with help from the Atomic Energy Commission, is making clear some obscurities concerning the mechanism of metal catalysis in a branch of fuel research which, in America, is regarded as an essential insurance against any future shortfall in natural petroleum supplies.

Members of the Mellon Institute Research team recently described to the American Chemical Society at its 118th meeting in Chicago some new information concerning iron catalysis made possible by study of the behaviour of radioactive ethyl alcohol.

"For a number of years, some of the research workers in the field of synthetic gasoline had postulated that carbon monoxide and hydrogen, combine on the surface of an iron catalyst to form simple alcohols and that these serve as starting points for building up the familiar hydrocarbon molecules of petroleum, oils, wax, etc.

Now, radioactive ethyl alcohol has been added to the carbon monoxide-hydrogen mixture passing over the catalyst. Analysis of the hydrocarbons formed showed that each standard unit volume of hydrocarbon vapour had the same radioactivity, regardless of the number of carbon atoms in each molecule. It is presumed that ethyl alcohol molecules are capable of adhering to the catalyst surface and serving as starting points for building up higher hydrocarbons. The present work has shown not only that ethyl alcohol molecules can act as starting nuclei in the catalytic hydrocarbon synthesis, but that the added carbon atoms predominantly build on only to one end of the alcohol molecule.

Utilising Waste Acid Liquors

In an attempt to utilise waste acid liquor discharged from steel works an experimental plant is to be erected in South Wales within the next 12 months. The plant has been planned by the British Iron and Steel Research Association and will produce about a ton of sulphuric acid a day.

EXPLOSIVES IN COAL MINES

Proposed Extension of Safeguards

INTERESTING facts about the uses of explosives in coal mines, put forward by an investigating committee, as well as recommendations for the improvement of current practice, are included in a recent report "Safety in the Use of Explosives in Coal Mines" (HMSO, 1s. 6d.).

The report serves incidentally to reveal the increasing use of explosives since the war, both in total weight and in the number of individual shots. Since 1945 the total tonnage of explosives used has increased by nearly 30 per cent and since 1935 has increased by about 78 per cent. During the same period (1935-49), however, the tonnage of coal produced per pound of explosive used has fallen from 8.83 to 4.54.

Of considerable interest to those concerned with the manufacture of explosives is that after careful consideration the committee has concluded that "the time has now come when it would be appropriate to make permitted explosives compulsory where safety lamps are required to be used, and to allow non-permitted explosives only in places where naked lights are allowed." This is one of the more important proposed changes in a new draft of the Explosives in Coal Mines Order.

So far as the coal dust explosion hazard arising from shot-firing is concerned, it is considered that the proper course is to prohibit non-permitted explosives in any dry and dusty places.

The general rule, as set out in the new proposed order reads: "All explosives taken or used below ground shall be permitted explosives, except that explosives of a non-permitted type may be taken or used in any part of a mine, other than a main haulage road or main intake airway, where naked lights are allowed in accordance with Section 32 of the Act and which is not dry and dusty."

Suggested Alternatives

The committee has pointed out that a valuable method of reducing the use of explosives is to take fuller advantage of alternatives, such as Cardox and Hydrox, hydraulic coal bursters and similar devices. The safety precautions prescribed in these orders are of a much simpler nature than those relating to explosives.

It is recommended that all colliery managements should consider carefully whether they could reduce shot-firing by improvements in methods of roof control, or by the use of machines for coal getting which do not necessitate the use of explosives, or by the use of alternatives.

The report recalls that several orders have recently been made under section 61 of the Coal Mines Act, 1911, applying to individual mines and permitting charges larger than the present maximum of 28 ounces to be used in a shot-hole when drifts are being blasted through hard rock with large rounds of shots fired by delay detonators. In this way charges of up to 48 ounces have been sanctioned and used, but the committee believes that no demand is likely for charges exceeding 48 ounces. There does not appear to be any particular reason of safety why the present limit should not be exceeded when firing shots in rock in stone drifts which require a heavier charge.

Accordingly it is recommended that cartridges of permitted explosives for general use should be marked "not more than 28 ounces in coal or rippings and not more than 48 ounces in stone drifts." The recent orders authorising the use of a 48-ounce charge have required that the shot-hole should be of a minimum depth, usually six feet, and stemmed completely to the mouth.

Sheathing

Where permitted explosives are used, it has been suggested that all cartridges should be sheathed, as was recommended by the Royal Commission. The committee does not think that this should be required by law, since cartridges of equivalent safety, but with no external sheath, have now been developed (by I.C.I., Ltd., THE CHEMICAL AGE, *61*, 562). It is recommended, however, that only sheathed cartridges or their equivalent should be used for ripping shots in all mines where firedamp is a hazard.

The committee considers that it would be better if there was less variation in the diameter of explosives cartridges. Some small sizes are used only to a very limited extent in certain districts. It would clearly be of advantage both to the users and the manufacturers if the number of different sizes in use could be reduced. The larger diameter cartridges are, in general, preferable to those of smaller diameter. It is not thought that the order need prescribe any specific diameters, but it is recommended that, as a matter of good practice, the use of cartridges of small diameter (say, under 1¼ in. excluding sheath) should be avoided.

CONTROL OF WEEDS ON THE RAILWAYS—II

Effects of Catalysts with Sodium Chlorate

by Ernest A. Dancaster, M.Sc., Ph.D., F.R.I.C.

THE continuous use by the railways of sodium chlorate, over so long a period, is an indication of its consistent action for killing weeds in general on the largest scale. That, however, does not invalidate the observation that much remains to be established concerning the mode of action and the disparity of some of the results of applications of sodium chlorate.

Bates[1] recalls that it can be demonstrated that sodium chlorate has a specific action on cellulose, and that the poisoning may be due to this. If so, it would explain why the action of the salt may be slow, and why there may be no visible result for several days and then a sudden collapse. The immunity of the fungi to chlorate poisoning does not disprove this view because fungal cellulose differs from that of the higher plants.

Doubtful Theory

It has often been stated that chlorate weedkillers act directly on the leaves and stems of plants and that the weedkiller should be sprayed on the weeds and not on the surrounding soil. One reason for adjusting the pH value of Atlacide to that of the plant sap is to facilitate the absorption of the solution. The addition of a spreader, a glue, soap or saponing in the proportion of 1:8000, is desirable to ensure that the hairs of the leaves and stems do not form air pockets and insulate the plant from the weedkiller.

The first tissue to be injured by the chlorate is the xylem, blackening of the phloem occurring later. The flow is strongly influenced by the amount of transpiration taking place, and therefore by those conditions which influence transpiration. The importance of transpiration to penetration and absorption of chlorate solution sprayed on leaves is also indicated by the results of experiments carried out on the amount of chlorate found inside and outside the leaves of plants sprayed with the solution and exposed to bright sunlight,[2] and by experiments on the effects of temperature (*see below*).

My own experiments indicate that equally good effects are obtained, whether the plants are sprayed or the surrounding soil. Field tests were carried out in which various species of weeds were sprayed over the leaves and stems with a 5 per cent solution of sodium chlorate, care being taken to keep any of the liquid from reaching the ground. Other plants of the same species were treated by applying the 5 per cent solution to the immediately surrounding ground, carefully avoiding wetting any part of the plants. With such a weak solution there was a greater probability of finding any small differences which might occur through using the two alternative methods of application than if a 10 per cent solution had been used.

No difference, however, could be observed in the results obtained with the two methods, except that the different species showed their usual varying degrees of resistance. Creeping thistles and docks were temporarily injured, but after a few days began to form fresh growth; all the other plants were killed outright within a week. Other experiments indicated that different strains of the same species, and even different individuals of the same strain differed in their powers of resistance to chlorate poisoning.

Laboratory tests were also carried out, in which the plants' roots were submerged in nutrient solutions so that they could continue to grow and thrive unless attacked by the chlorate. These were treated as follows:—

Sets		$NaClO_3$
A	in 500 c.c. solution containing	0 05%
B		0 10%
C		0 20%
D, E & F		no chlorate.

Plant sets A, B and C were not sprayed, while sets D, E and F were sprayed on the stem and leaves in these proportions:—

Sets		$NaClO_3$	
D	sprayed with a	0 05%	solution
E	,,	,, 0 10%	,,
F	,,	,, 0 20%	,,

Effects Compared

No appreciable difference could be observed between the sprayed plants and those with their roots in the chlorate solution. As in the field tests, all the plants except the creeping thistles and docks were killed outright within a week. The creeping thistles showed a considerable difference when treated with solutions of different concentrations; with the weakest solution the plants recovered completely, even those with their roots in the solution producing vigorous new shoots 17 days after the beginning of the test; those treated with 0.10 per cent chlorate made faint attempts at recovery but ultimately died; those treated with 0.20 per cent solution died within two weeks without making any attempt at recovery.

The docks were more resistant; all ultimately recovered. Chlorate does not appear to be very effective against this plant in concentrations that are used in practice.

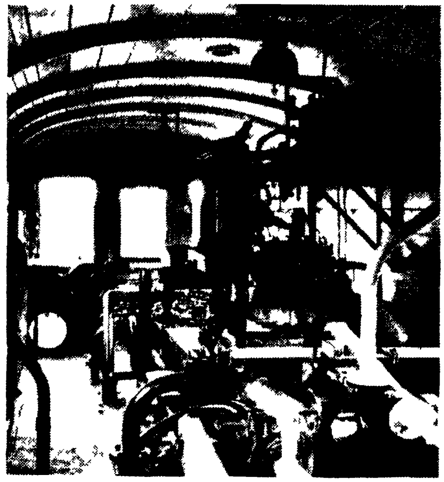
The growth of vigorous shoots even when submerged in chlorate solution suggests the possibility that the salt may have been used up during the first days of the test, so that the new shoots were actually growing in a medium free from chlorate. To test this, specimens of creeping thistle, dock and black nightshade were given this treatment: each plant was kept with its roots in 500 c.c. of an aqueous solution of sodium chlorate, some being placed in a 0.05 per cent solution and some in a 0.10 per cent, and one of the docks in a 0.20 per cent solution. The volume and concentration of the solutions were determined at the end of the test.

The concentration of chlorate remained constant within the limits of experimental error in all cases. The amount of solution taken up by the plants is shown in the table.

Plant	0 05% Solution		0 10% Solution		0 20% Solution	
	Loss in c c	Loss % Vol	Loss in c c	Loss % Vol	Loss in c c	Loss % Vol
Creeping thistle	67	13 4	23	4 6	—	–
,, ,,	20	4 2	24	4 8	–	—
Dock	101	20 2	60	12 0	51	10 2
Black nightshade	16	3 2	9	1 8	–	
,, ,,	38	7 6	16	3 2	--	—

Even testing so few plants renders it obvious that the amount of solution absorbed becomes appreciably less as the concentration is increased, and that the amount depends upon the degree to which the plant is affected. The black nightshades were quickly killed and they absorbed comparatively little solution, while the highly resistant docks took up a considerable quantity, especially of the 0.05 per cent solution.

One of the creeping thistles was of special interest. Although the plant is usually very resistant this specimen appeared to be allergic to chlorate as it suffered severely and quickly, although in the weakest solution, so that it was unable to absorb more than 20 c.c. before being killed.



One of the " mobile pumping stations " through which the chlorate solution is delivered to the multiple sprays on the front of the train

The temperature also had a considerable effect on the amount of solution absorbed, and therefore on the damage done to the plant. The tests with the black nightshade were started late in September during a cold period, with the result that the plants were quite unaffected after 24 hours and had absorbed little solution.

The jars containing the plants were then placed in a room kept at 65°F. Within 24 hours at this temperature considerable deterioration was observable; the leaves were shrivelling and softening. After a further 24 hours the plants appeared to be quite dead and the leaves were being shed.

The main practical result of the tests is

[Photographs by courtesy of the Railway Executive

The magnitude of the requirement of chlorate solution is revealed by the number of tank cars used by this weed-killing train in the Southern Region

that they show that spraying can be started earlier in the year than is usual in practice. This, from the railway's point of view, is an important point because the large mileage to be treated renders it difficult to get the work finished before the weeds start seeding. It is, however, necessary to avoid spraying when the temperature is too low.

Changing the Balance

Different species of plants and different strains of the same species vary so much in their susceptibility to the poisoning effects of chlorate, that the possibility arises that trouble may come in the future through the elimination of the more susceptible plants and the consequent increase in the numbers of the more resistant kinds. So far, however, this does not appear to have occurred to any appreciable extent.

The fact that the soil does not remain sterile cannot be due to the small amount of chlorate used up by the plants, but must be mainly due to loss of the salt through dilution, washing away, and gradual decomposition.

Although sodium chlorate has so far proved to be the best weedkiller for use on railways, this does not preclude the possibility of increasing its poisonous properties. The most obvious way of doing this is by means of a suitable catalyst. Bates[3] tried a 10 per cent solution of sodium chlorate containing 0.02 per cent of vanadium pentoxide, and compared the results with those obtained with a 10 per cent solution of the chlorate only, and with a 0.02 per cent solution of vanadium pentoxide only. The trailing stems of bramble were treated by placing their cut ends in bottles containing 50 c.c. of solution. Not only were the stems treated with the solution containing vanadium attacked more rapidly and with greater severity than those treated with sodium chlorate only, but there was also a marked difference in the appearance of the plants. The stems became quite white for about a foot above the point of immersion, merging into pale yellow above this level. The leaves also took on a light yellow tint. In a field test the plants treated with the chlorate solution containing vanadium pentoxide could be readily distinguished from those treated with that containing sodium chlorate only. No effect could be observed when a solution of 0.02 per cent vanadium pentoxide was used. The catalytic effect of vanadium was not so marked when the solution was applied as a spray, but the poisonous nature of the chlorate was again distinctly increased.

Vanadium pentoxide is an expensive material and is only slightly soluble. It therefore appeared desirable to search for a more suitable catalyst and with this objective I tried various compounds of manganese, cobalt and nickel.[4] These metals were chosen because of their frequent occurrence in plant tissues, and in addition, the first two are known to play an important part in biochemical processes, probably on account of their catalytic action. Also, there was the well-known effect of manganese in facilitating the liberation of oxygen from sodium chlorate. The action of these compounds on sodium chlorate and on Atlacide was investigated, both in the laboratory and in field tests, and a few tests were also made with vanadium pentoxide.

For the laboratory trials the trailing stems of the Canadian blackberry, the wild bramble, and the wild dog-rose were employed. The cut ends of the stems were placed in tubes each containing 50 c.c. of the solution under test. The following solutions were used:—

Plant	Solution
Canadian Blackberry ...	10% $NaClO_3$
	with 0.03% $MnCl_2.4H_2O$
	,, 0.03% $MnSO_4.4H_2O$
	,, 0.02% M $KMno_4$
	,, 0.04% $CoCl_2.6H_2O$
	,, 0.04% $NiSO_4.6H_2O$
	5% $NaClO_3$ only
	with 0.015% $MnCl_2.4H_2O$
	,, 0.015% $MnSO_4.4H_2O$
	,, 0.01% $KMnO_4$
	,, 0.02% $CoCl_2.6H_2O$
	,, 0.02% $NiSO_4.6H_2O$
	2.5 % $NaClO_3$ only
	with 0.015% $MnCl_2.4H$ O
	,, 0.03% ,,
	,, 0.06% ,,
	,, 0.08% $CoCl_2.6H$ O
	,, 0.08% $NiCl_2.6H$ O
	,, 0.01% V_2O_5
Wild bramble	1 part 'Atlacide' concentrate : 3 parts water
	with 0.03% $MnCl_2.4H_2O$
	,, 0.04% $CoCl_2.6H_2O$
	,, 0.06% $MnCl_2.4H_2O$
	,, 0.04% $KMnO_4$
	,, 0.08% $CoSO_4.6H_2O$
	,, 0.08% $CoCl_2.6H_2O$
	,, 0.08% $NiSO_4.6H_2O$
	,, 0.08% $NiCl_2.6H_2O$
Wild dog-rose	2.5% $NaClO_3$ only
	with 0.015% $MnCl_2$ $4H_2O$
	,, 0.03% ,,
	,, 0.01% ,,

Solution Strengths

The 5 per cent solutions were used because a 10 per cent solution of sodium chlorate is more concentrated than that which was used on the Southern Railway. The 2.5 per cent solutions were chosen because it was thought such a dilute solution would kill the specimens very slowly, if at all, and therefore the effects of the catalysts would be more noticeable. Although the action was somewhat delayed with this dilute solution, all the specimens were killed in from 10 to 18 days, and the

action of the catalysts was no more marked than with the stronger solutions.

Similar results were obtained with all the catalysts, the lethal effect of the chlorate being increased in each case. This was indicated by the rate at which the specimens died and the changes which occurred in the leaves and stems. The vanadium pentoxide appeared to be the most potent, the leaves of the plants being more blackened and the stems more stained when this compound was used as the catalyst. Little difference could be seen between the effects of the other catalysts.

The amount of catalyst is important. The least effect is obtained with 0.01 per cent (calculated as anhydrous salt) and the greatest effect with 0.04 per cent. The solutions of the catalysts alone had no appreciable effect on the plants. These results agreed with those obtained by Bates with vanadium pentoxide. This was to be expected because dilute solutions of manganese and cobalt compounds are known to have a beneficial effect upon plants. Different strains of the same species again showed marked differences in their powers of resistance.

Small field tests were made on plots each 4 sq. yards in area, chosen so as to be alike as possible, though in fact there were considerable differences. The weedkiller used for these tests was Atlacide with and without the addition of a catalyst. The solutions were sprayed evenly on the plots, at the rate of one pint to each plot. In the first test the solutions used were as follows:

Plot No.	Atlacide	Catalyst
1	1 part concentrate to 3 parts water	None
2	,, ,, ,,	0.015% $MnSO_4.4H_2O$
3	,, ,, ,,	0.03% ,,
4	1 part concentrate to 5 parts water	None
5	,, ,, ,,	0.015% $MnSO_4.4H_2O$
6	,, ,, ,,	0.03% ,,
7	,, ,, ,,	0.03% $CoCl_2.6H_2O$
8	,, ,, ,,	0.015% V_2O_5

In the second test four plots were chosen. A and B were more uniform, and contained more resistant plants than C and D. The solutions used are shown below:—

Plots	Atlacide	Catalyst
A & B	1 part concentrate to 6 parts water	None
C & D	,, ,, ,,	0.03% $MnCl_2.4H_2O$

A third test was carried out on the same lines as the previous one, but the Atlacide concentrate was diluted in the proportion of 1 part concentrate to 8 parts of water; the catalysed portion of the solution contained 0.06 per cent of $MnCl_2.4H_2O$.

Although differences between the plots made close comparison difficult, reliable results could be obtained by comparing the effects on particular species, such as the bindweed. It was evident that the manganese salts were effective in promoting the lethal action of the chlorate, especially where weak solutions ot Atlacide were used. The action of the other catalysts was not so definite.

The results of the tests were sufficiently promising to justify trials on a much larger scale. Two stretches of track in the running line and three sidings in a marshalling yard were chosen for the trials. The sites were examined before spraying took place, about a week after the operation, and again after an interval of about three months. At each site the track was divided into five parts which were sprayed as follows:—

Section	Atlacide	Catalyst
A	1 part concentrate to 3 parts water	None
B	,, ,, ,,	0.03% $MnCl_2.4H_2O$
C	,, ,, ,,	0.06% ,,
D	1 part concentrate to 5 parts water	0.03% ,,
E	,, ,, ,,	0.06% ,,

All the solutions proved lethal, a satisfactory kill being obtained in each case. However, as a 1:5 uncatalysed solution is known to be definitely inferior to a 1:3 solution, there was satisfactory evidence that the manganous chloride did increase the lethal properties of the Atlacide, because the 1:5 catalysed herbicide was as effective as the uncatalysed 1:3. Also, the addition of 0.06 per cent of manganous chloride gave better results than those obtained with only 0.03 per cent.

The results obtained from the large scale tests were considered so satisfactory that the following year the whole of the weed-killing on the Southern Railway was carried out with a solution containing 1 part of Atlacide concentrate to five parts of water, with 0.1 per cent of manganous chloride. Although the year was not a good one for weed killing, the results were on the whole satisfactory, and compared favourably with those obtained on other railways. A catalysed 1:5 solution of Atlacide concentrate was again used the following years.

The reports sent in by the inspectors were somewhat variable, probably because of differences in the weather conditions when the killing was carried out on the various sections. As a result of these reports it was decided to abandon the use of the catalyst and to revert to the original 1:3 solution. Further investigation of the use of catalysts for enhancing the lethal qualities of chlorate killers seems desirable.

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Reviewing Paint Problems

Colour Chemists Discuss Colour Control

FUGITIVE colours and the difficulty of avoiding gradual departure from established colour standards were considered in some detail at the opening session in London on September 27 of the Oil and Colour Chemists' Association. The meeting, at which the chairman, Mr. L. O. Kekwick, presided, was in the form of a "brains trust."

Unreliable Standards

In reply to a question asking what were the best methods of avoiding a slow drift of colour standards, Dr. R. F. Bowles said that he did not think there was a problem, provided the matter was tackled systematically and carefully. He believed there was a great deal of slap-dash work done in the preparation of the standards in the first place, and there was not sufficient care in storage; as a result, variations arose. Further, in the past there had been no method of measuring a colour when it was standardised; so that there had been some excuse until recently, when methods of measuring colour began to become available.

Attempts to maintain a standard in the wet form seemed to him illogical. A wet material was by its nature unstable, and in consequence, physical and chemical changes were bound to occur in a liquid that was kept for any length of time. There was sedimentation and in particular, differential flocculation of the various pigments—and possibly other chemical changes involving soap formation and so on, all of which might affect the colour.

Dr. Bowles thought that a standard should be kept in a solid state, *i.e.*, in the form of a panel, or a print. A really accurate colour measurement of the standard panels or prints must involve standard illumination and spectro-photometric data on the colour itself. It was essential to know how the actual colour specimen was made up. Particularly with secondary and tertiary colours, it was very difficult to make a satisfactory match by using mixtures of colours which were spectrally different.

In Dr. Bowles's opinion there was no excuse for saying that colour could not be measured. The instruments were expensive but the average works would think nothing of paying **£1000** for a new piece of manufacturing plant. Therefore, they should not boggle at paying £500 or £600 for an instrument to measure colour accurately, and which was, in his opinion, equally important for carrying on business.

The chairman agreed that there seemed to be no possible course other than to use spectral methods. Dr. Bowles had pointed out that £600 would be well spent on an instrument from which a manufacturer could obtain figures on which he could reproduce colours. It was probable, however, that many firms could not afford it, even if they were in complete agreement with Dr. Bowles.

Yellowing

A question was asked whether there was any relationship between yellowing, on exposure to light and to moderate heat, with varnish and resin films, and how yellowing could best be assessed.

Mr. R. J. Ledwith (past chairman of the section) said he believed yellowing was due in many cases, to the nature of the drying oil present, and in some cases to the nature of the resin used; and, of course, the two effects frequently overlapped.

With regard to oils, it was generally believed that the amount of yellowing was affected by the proportion of linoleic acid present.

Discussing the yellowing of resin films as distinct from varnishes, Mr. Ledwith said it was in the paraffin phenolic resin films that one noticed the most phenomenal degree of yellowing. It was not clear what happened there.

The question concerning the assessment of yellowing, Mr. Ledwith suggested, might well be left. There were rough and ready methods, but obviously a quantitative colorimetric method was far preferable.

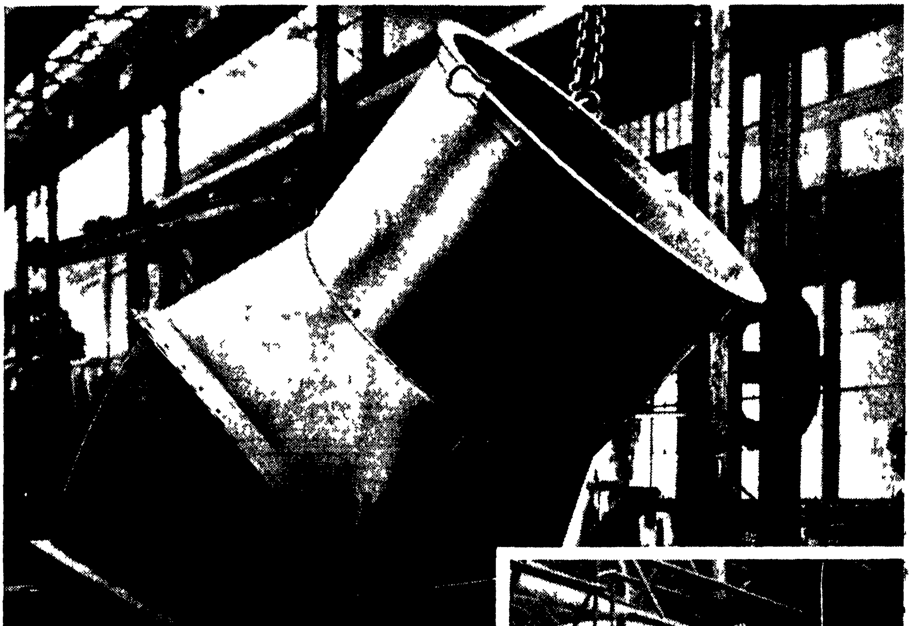
Mr. L. F. Parker said that if yellowing of a film could be correlated to its exposure to heat and light this would provide a speedy test to show whether or not a film would yellow. It appeared, however, that the yellowing varied with the nature of the radiation imposed on the film, and the correlation might vary also according to the particular type of resin or other chemical compound which was irradiated.

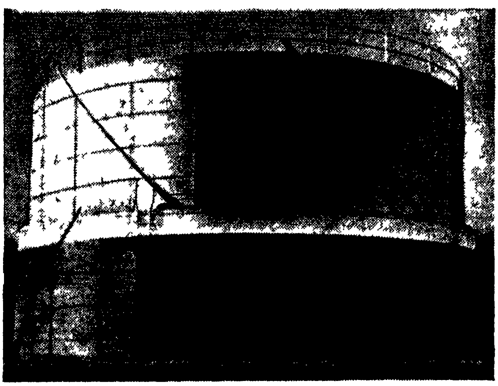
Oils and Fats Prices Unchanged

No change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the five-week period ending November 4, 1950.

Metallurgical Section

Published the first Saturday in the month





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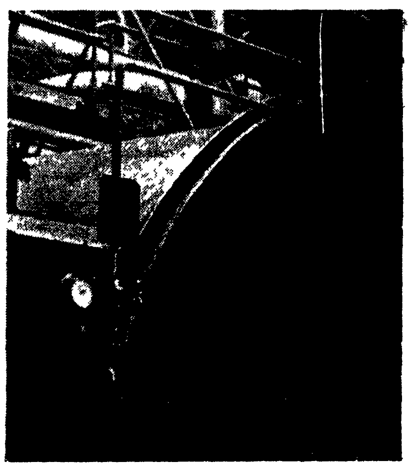

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Metallurgical Section

7 October 1950

RECORD STEEL PRODUCTION

"We Can Meet All Demands"

INTERESTING facts and figures relating to the output of British iron and steel are given in the Monthly Statistical Bulletin of the British Iron and Steel Federation for August. (*25*, 8, 1-6).

Referring to the relaxing of the control of steel distribution three months ago, the report says that the change was made possible by the steady growth of steel production and the consequent easing of the supply position—as had been evidenced by the accumulation of stocks in a period of high consumption. At 8,309,000 tons, the output of steel ingots and castings in the first half of 1950 was 4½ per cent above the corresponding 1949 figure (itself a record) and about half as much again as the 1935-38 average.

Increased Stocks

This record rate of production, reflecting the gradual expansion of steelmaking capacity and the high level of home and imported scrap supplies, has not been achieved at the expense of raw material stocks. On the contrary, the industry's stocks of pig iron and scrap are, respectively, 23 per cent and 18 per cent higher than they were a year ago, and are more than double the corresponding 1948 figures.

The further advance in steel production has been achieved with practically no addition to the industry's labour force. Hence, productivity per man-year (all workers) in steel melting and rolling rose by 8½ points, from 131.1 per cent of the 1938 average in January-June, 1949, to 141.6 per cent this year.

By helping to raise productivity and by reducing the need for imported semis, this advance in production has so far enabled the industry to absorb the cost of the increase in railway freight rates which came into force on May 15 (amounting to about £6 million a year) and so to keep steel prices stable at a low level.

Imports, which had amounted to 1,136,000 ingot tons in 1949, were only about 436,000 ingot tons in the first seven months of this year and are expected to continue at approximately this rate for the remainder of 1950.

In view of the reduction of imports, total supplies in 1950 cannot be much above the 1949 figure. Allowing for second-hand and re-usable material, the total may be tentatively put at 17.4 million ingot tons, against 17.2 million in 1949:

STEEL SUPPLIES FORECAST
(million tons—ingot equivalent)

	1948	1949	1950 (Estimated)
Crude steel production ...	14.9	15.6	16.2
Imports	0.5	1.1	0.7
Re-usable material, etc.	0.6	0.5	0.5
Total	16.0	17.2	17.4

Assuming, therefore, that total stocks are, on balance, maintained this year at the end-1949 level an extra three-quarters of a million tons of steel should be available, compared with last year, for consumption at home or abroad.

In concluding its survey of the first half of 1950 the report points out that any marked change in the pattern of industrial production—*e.g.*, a switch from tractors to tanks—would inevitably mean a temporary drop in productivity and therefore in steel requirements. There is thus no reason why the acceleration of the defence programme should cause any appreciable increase in total steel requirements in the near future.

FBI View of Steel Vesting

THAT any generally acceptable method that could be found to avoid the disturbance involved in nationalising the steel industry, would also have the wholehearted support of industries, has been stressed by the president of the Federation of British Industries, Sir Robert Sinclair. He said at a local meeting of the Federation at Huddersfield last week that he hoped some agreed basis might yet be found for postponement of nationalisation project. The arrangements for vesting and the setting up of the Steel Corporation and its subsidiary organisations must put a heavy drain on the time and thought of many whose energies and ability were important to defence.

Rising Exports of Non-Ferrous Metals

Substantial Reduction of Stocks

EXPORTS of non-ferrous metals in August were marked by notable increases in zinc concentrates and tin, compared both with the previous month and with August, 1949.

Stocks at the close of the period contrasted with the level at the same month last year showed these diminished totals (in long tons): blister copper 47,338 (57,619); refined copper 78,810 (92,329); slab zinc 54,662 (75,743); and tin 7667 (15,978). Production achieved some advances over August 1949: in slab zinc 5126 (4685); lead in concentrates 230 (145); and English refined lead 4813 (1861). Consumption generally remained at about the same level.

Data set out below is from the summary issued by the British Bureau of Non-Ferrous Metal Statistics.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	49,559	77,312
Imports	4,779	19,604
PRODUCTION:		
Primary	—	5,487
Secondary	1,841*	4,677
CONSUMPTION:		
Primary	5,517	24,038
Secondary	—	13,968
Exports	4,133†	23
CLOSING STOCKS:		
Govt. and consumers'	47,338	78,810

* Rough copper.
† Includes 2971 tons of rough copper despatched to Belgium and 1162 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	23,291 long tons
Alloyed copper products	20,953 ,, ,,
Copper sulphate	3,098 ,, ,,

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	37,398	58,168
Imports	13,674	8,311
PRODUCTION:		
Virgin and remelted	19*	5,126
CONSUMPTION:		
Virgin (incl. debased)	6,360	17,262
Remelted and scrap	—	5,918
Exports and re-export	450	—
CLOSING STOCKS:		
Govt. and consumers'	44,731	54,662

* Total production May-August, 1950.

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	68,001	5,993	—
Other stocks ...	65	—	—	—
IMPORTS	—	21,968	—	133
PRODUCTION ...	230	—	4,813	—
CONSUMPTION ..	240	13,459	4,688	6,918
EXPORTS ...	—	6	—	—
CLOSING STOCKS:				
Govt. and consumers' ..	—	75,189	6,118	—
Other stocks .	55	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	7,667
IMPORTS	43
PRODUCTION	—
CONSUMPTION	1,782
EXPORTS AND RE-EXPORTS	3,378*

* Exports total 3362 tons, of which to U.S.A., 1815; Denmark, 225; Germany, 224; France, 189; Canada, 183; Sweden, 175; U.S.S.R., 125.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	427
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	246

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	46.95

Awards for Welding Investigation

THE Council of the British Welding Research Association has awarded the 1949 Welding Research Prize of £100 to Dr. K. Winterton, Mr. J. G. Ball and Mr. C. L. M. Cottrell for their joint paper describing "A New Weldability Test for Magnesium Alloy Sheet."

This prize has been donated by the British Oxygen Co., Ltd., which will provide a prize fund for three years for a competition relating to welding. The closing date for entries for the 1950 competition will be extended to December 31, 1950.

A single prize of £100 is offered again this year and will be awarded for the best paper submitted on a research into welding or its applications. The secretary, British Welding Research Association, 29, Park Crescent, London, W.1, is the source of information about this competition.

ACTIVE CENTRES ON METAL SURFACES

New Theory Follows Recent German Work

THE so-called "active centres" on metal surfaces are distinguishable from other surface areas because they have a much stronger adsorptive power. In a paper dealing with active centres Professor Dr. Otto Erbacher (*Angewandte Chem.*, 1950, *62*, 17, 403-404) says that only at these active points are hydrogen and other molecules so strongly adsorbed that the resulting deformation amounts to decomposition or solution (catalysis).

These reactions have long been used to determine by comparison the relative active surface areas. At the Kaiser Wilhelm Institute of Chemistry experiments have been carried out to determine the active areas on platinum metal by exchanging adsorbed hydrogen ions (or atoms) with noble metal ions corresponding to a monatomic film. After roll-polishing and heating to 1230° K. platinum was 42 per cent active, and after emery-polishing it was 87 per cent active.

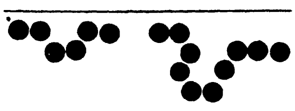


Fig 1

From results of recent work the author has propounded certain views on the nature of these metallic active centres (*Zt. Elektrochem.*, 1949, *53*, 67). These are put forward as a working theory which supposes that all mechanically worked metallic surfaces are strewn with disturbed areas (Störstellen) of atomic thickness (Fig. 1).

Melting Points of Metals (Keluin Scale)

Bi	544 K	Au	1336 K.	Pt	2046.5°K·
Pb	600	Cu	1357	Ru	2223
Zn	692	Ni	1726	Rh	2239
Mg	930	Co	1765	Ir	2727
Al	931	Fe	1808	Os	2773
Ag	1233.5	Pd	1828	Ta	3303

The simplest case is that of metal atoms in one plane in which a single atom is missing. The interaction or interconnection of the typical activity spheres in the individual metal atoms is then only moderately enhanced. But because of their geometrical position neighbouring disturbed areas soon become affected and there is mutual interaction between activity spheres of such areas. These areas, which are still of atomic dimensions, are named "disturbance spots" (störflecken), and comprise the actual "active centres." Their surface energy is conditioned among other things, by the extent of superposition of activity spheres.

Apparently the only metals recorded in the literature as having active centres are those with m.p. above 1300° K, *i.e.*, Pd, Pt, Ir, Fe, Ni, Co, Ta, Cu and Au.

In an attempt to explain this phenomenon the possibility of a "healing" or clearing up process in these areas was considered. This would occur at a temperature at which the more or less exposed surface atoms are in motion (analogous with the Tammann softening point). In this connection, however, it would be necessary to know the maximum temperature reached during and after the formation of the outer surface layer. More particularly it would seem that, in the case of metals with m.p. up to about 1200° K, a temperature is reached sufficient to achieve this healing of disturbed areas—if the "healing" hypothesis is correct. Assuming this temperature to be two-thirds of m.p., then for 1200° K. m.p. it would be about 800° K. or approximately 525° C.

No Active Centres

If in the surface treatment of these metals, *e.g.*, by polishing with emery, etc.—sometimes at a purposely raised temperature—a temperature is reached in the outermost atomic layer only of 500-525° C., then, according to the "healing" hypothesis, the fact that metals with m.p. of 1200° K. (or less) exhibit no active centres would be explained.

If movement of the atoms in this outermost layer occurs at a still lower temperature than two-thirds of m.p.—which, from consideration of evaporation rates in radio-active metals is feasible—then a temperature of less than 500° C. in mechanical surfacing of metals would be sufficient to prevent the formation or continuance of active centres or disturbed areas. Such a friction temperature at the outermost atomic layer is by no means improbable if one considers, for example, the case of wire subjected to mechanical treatment—rubbing, polishing, etc.

In the case of the metals with higher m.p., such as gold, etc., the time factor is also important in regard to movement of surface atoms. It is to be expected that, with the same time and temperature as in the mechanical treatment of metal surfaces, the probability of movement in these atoms decreases with rising

m.p., thus giving a corresponding increase in active centre areas. In the few cases so far experimentally studied results have been obtained which are in accordance with these views.

Some results are quoted from earlier work (*loc. cit.*) and from a paper by G. Rienäcker *et al* (*Zt. anorg. Chem.*, 1948, *257*, 41) dealing with tests on gold, copper, and gold-platinum alloys. Activities were measured by means of hydrogen potentials, after various surface treatments, etchings, etc. Active areas disappeared when heated to red heat. These results, as far as they go, confirm the author's hypothesis.

Copper-Platinum Alloys

Rienäcker's work with etched copper-platinum alloys is described in some detail. After three hours of heating at about 1070° K. in a hydrogen atmosphere, pure copper showed a 10^4 smaller activity than pure platinum; and in the case of these two metals in alloy the activity of the Pt predominated out of all proportion to its content until the high Cu alloys were used, as shown in the curve (Fig. 2). This is especially so up to 16 atomic per cent Pt.

The author elaborates this curve in another figure to show that this persistently high activity of the platinum despite admixture with copper is explicable by his hypothesis (Fig. 8). Instead of logarithmic abscissae (as in Fig. 2) the author used both crystallising temperatures (°K.) and Pt activity percentage areas. It will be seen that up to 16 atomic per cent Pt and at about 1500° K. there is fairly close relationship showing a decline between Pt content and activity. This would seem to indicate that in this face-centred cubic crystallisation " nests " of Pt atoms are formed, and thus make possible the creation of Pt disturbance areas.

A further result of Rienäcker's work also agrees with the ideas already mentioned. Prolonged heating or tempering, with ordering of atoms, leads to corresponding activity losses (circle point in Fig. 8), *i.e.*, through clearing up of disturbance spots. Referring to the rather abrupt break in this uniform relationship between Pt content and declining activity (up to about 16 atomic per cent Pt), the author says that, unfortunately, no activity determinations were made between 16 and 2 atomic per cent Pt. However, one may probably agree with Rienäcker that this break does not occur with a Pt content much below 16 atomic per cent, since all alloys with still smaller Pt contents have m.p. less than 1500° K. This means that the two-thirds level would be exceeded by heating to about 1070° K, and the disturbance spots *ex hypothesi* would be eliminated (ausgeheilt).

Earlier Work

In some earlier work (*Angewandte Chem.*, 1944, *57*, 86) to determine hydrogenation activities of Cu:Pt and Cu:Pd alloys Rienäcker found that the greatest decline in activity occurred with substantially higher Pd than Pt content. Given the same preliminary treatment temperature, this would also be explicable by the author's hypothesis. Since the m.p. of Cu:Pd alloys is lower than that of the Cu:Pt alloys, the m.p. of 1500° K. is attained even with higher Pd content and the disturbance spots can be removed. It is, of course, not necessary that the critical temperature should always be two-thirds of m.p.: under special circumstances it

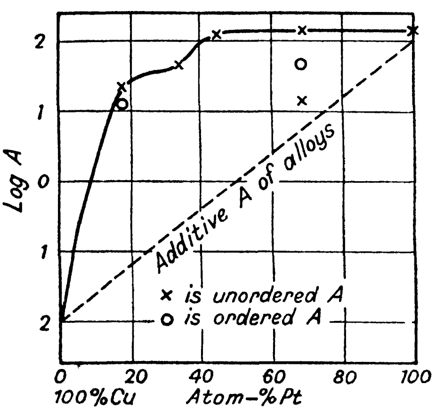


Fig. 2

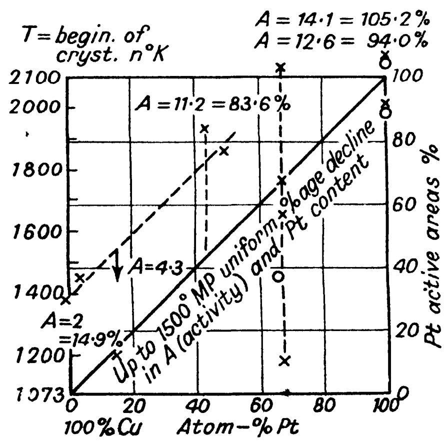


Fig. 8

may deviate considerably from this value.

It is interesting to note Rienäcker's result that by heating Cu and Pt and their alloys to 1070° K. for three hours a rather more marked loss in activity occurred *in vacuo* than in a hydrogen atmosphere. In the absence of external gas pressure it was possible that the more loosely held atoms at the surface become mobile at a much lower temperature, whereas the m.p. of the more compact and solid metal is lowered by only a few degrees. That there is a greater atomic mobility at the surface is also shown by the deposition on a noble metal of more or less imponderable radioactive isotopes of lead and bismuth. These isotopes completely vaporise at 650° C and 860° C. respectively, while the b.p. of the solid metals is 1750° C. and 1560° C. respectively at atmospheric pressure. It is therefore essential to know the maximum temperature to which the metallic surface is exposed, before or during the activation test.

If a solvent reactive with the metal is present another factor is introduced. For example, in the study of metal ion adsorption at the surface of previously polished nickel plate no preferential or superactive areas could be observed, although the polishing temperature was certainly below two-thirds of m.p. 1726° K, and Ni (as powder of a spongy type) is mostly used as a catalyst.

Tests were made using 0.1 N HCl at 79° C., and in 12 per cent HCl and in 0.1 N HNO_3 at ordinary temperatures for about 90 minutes, and only by long continued treatment could the gradual disappearance (solution) of the disturbance spots be effected. In certain conditions, therefore, solvent action must also be taken into account. On the other hand, brief action by a strong etching agent, *e.g.*, on the metal structure or lattice, may produce these disturbance areas, as was found with Au. Pt and with alloys of Cu:Pt and Au:Pt.

While investigating the active surface areas of Pt and Pd, the author found, rather surprisingly, that after polishing, Pd per unit surface area gave rather smaller figures than Pt with its higher m.p.

Although this behaviour is contrary to that generally found in the spongy form of these metals it nevertheless supports the hypothesis. The author is, however, careful to point out the tentative nature of his conclusions.

New Stable Fluorocarbons

THE production of new fluorocarbon compounds stable to red hot metals without decomposition, was announced at a recent meeting of the American Institute of Chemical Engineers. Because fluorocarbon acids are as strong as mineral acids and more stable than corresponding hydrocarbon acids, they offer a ready starting point for the synthesis of a variety of new organic compounds.

These fluorocarbons are attracting the interest of chemical, mechanical and electrical engineers as potential cooling liquids, lubricants, and dielectric fluids. The liquids have extremely low surface tensions, low refractive indices, and high compressibilities. Some of the bromide derivatives are very powerful non-toxic fire extinguishing agents.

The new compounds are made by an electrochemical process now patented by Minnesota Mining and Manufacturing Company. The company is now investigating application possibilities and plans to build the first unit of a manufacturing plant in the very near future.

Closing a Steel Factory

REFERENCE to the efforts by union officials and shop stewards to have the Ministry of Supply steel-making factory kept open at Linwood, Renfrewshire, was made in a statement issued by the Paisley District Committee of the Amalgamated Engineering Union. Mr. Douglas Johnston, M.P. for Paisley, is stated to have said on September 26 that the Board of Trade believed that there were possibilities that the Pressed Steel Company would employ more workers, and might play a part in rearmament. The factory, which employs 540, is considered uneconomic.

The Chemist's Bookshelf

ADHESIVES. Selected Government Research Reports, Vol. 7. London, 1950. HMSO, Pp. 89. 7s. 6d.

The latest addition to the series, " Selected Government Research Reports ", contains five reports which deal in turn with " Synthetic Resin Glues : Preliminary Study of Factors Affecting the Strength of Glued Joints in Aluminium Alloys", "Adhesion of Glues to Plywood" (two parts), " Tests to Determine the Effects of Various Types of Adhesives on the Final Shape of Laminated Bends ", and " The Part Played by Formaldehyde in Dermatitis Attributable to Synthetic Resin Glues." Each report, which is prefaced by an abstract of the problems under consideration, gives a comprehensive survey of the factors involved in the production of synthetic adhesives, their use and performance. Part 2 of " Adhesion of Glues to Plywood " serves to illustrate the very adequate treatment of the subject matter. An abstract of the contents of the report is followed by an introduction. The next section lists the tests for gluing properties of plywood. Sections 3 and 4 deal respectively with the incidence of defective gluing with different kinds of wood and different kinds of glue. After this a section of 16 pages surveys factors contributing to bad adhesion. This is followed by a general discussion and the report proper ends with a review of remedies for case-hardening (Section 7). Finally there is an appendix. These reports are detailed and complete, are generously illustrated with photographs and diagrams and contain extensive graphical data.—P.M.

ANORGANISCH-PRAPARATIVE CHEMIE. Dr. Herbert Grubitsch, Springer-Verlag, Vienna. 1950. Pp. xxiii+480. Price £2 9s. 6d.

The student is not alone in needing working guidance; the independent research chemist also meets plenty of experimental difficulties and will be the first to recognise that only an exact practice, even by simple methods, can lead to incontestable results. The present book applies to all engaged in practical inorganic-preparative work, both the student and the research chemist. The author, who is professor at the Technical High School, Helsinki, obviously draws upon a long teaching experience, and endeavours to explain the most exact processes, giving practical manageable directions, as well as presenting the fundamental theoretical discussions. The book is divided into a first, general part (pp. 1-230), dealing with the techniques of the experiments specially for the inorganic chemist. The second, special part (pp. 231-460) reviews the stability of chemical compounds and discusses in detail more than 150 preparations, which are so chosen that a great variety of methods is represented. They are arranged according to the periodic system beginning with the non-metals and followed by the metals. There are many tables and 22 text-figures. The literature is comprehensively considered and a name and subject index facilitates the use of this very commendable text book.

Fusion-Welded Pressure Vessels

A DISCUSSION on the provisional British Standard Code 1500 : 1940 for fusion-welded pressure vessels for use in the chemical and allied industries will be held in the lecture theatre of the Institution of Civil Engineers, Great George Street, London, S.W.1, at 5.30 pm. on Tuesday, October 10.

The code (reviewed in THE CHEMICAL AGE, *61*, 907) covers new standards of construction and testing and is the first of a series of similar codes to cover forged vessels and other methods of construction, such as riveting, brazing, etc.

The discussion is being organised by the Institution of Chemical Engineers and will be opened by Mr. J. Arthur Reavell, chairman of the Drafting Committee. Developments and technical aspects of the code will be described by Mr. M. B. Donald, Mr. W. J. Strawson and Mr. F. Peel.

Several copies of the code (which may be obtained from the British Standards Institution, 25s. post paid) are available in the library of the Institution of Chemical Engineers, where members may consult them.

Technical Publications

COPPER tubes from 1 in. to 2 in. i/d (B.S.S. 659) can be bent to any angle up to and including 180° in the Staffa ratchet bending attachment manufactured by Chamberlain Industries, Ltd., Leyton. The attachment consists mainly of two components, the frame carrying the hydraulic pump, and the bending arm housing the adjustable back former pin.

* * *

THE important rôle of coking plants in the industrial and agricultural production of India is described in a well illustrated booklet "Coke Ovens in India," published by Simon-Carves, Ltd., Stockport. There are at present 14 batteries working in India, 11 of which have been built by the company. The 11 Simon-Carves batteries deal with over 3 million tons of coal out of the 3½ million tons carbonised annually in Indian coke ovens. They yield over 25,000 tons of ammonium sulphate for use as fertiliser, and some 15 million gal. of tar.

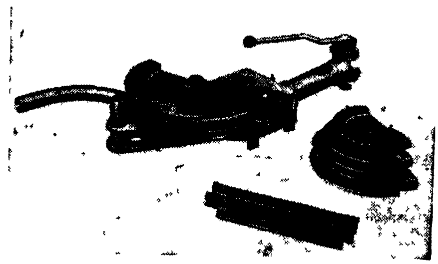
* * *

THE new revised bulletin E-1-2 of the Celanese Corporation of America contains details on performance studies of Celanese solvents 203 and 601 in nitrocellulose formulations. These tests are stated to indicate that the employment of Celanese solvents in both lacquer and thinner makes possible the use of higher solids, without sacrifice of blush resistance, drying time, or other properties. The 601 formulation will replace ethyl acetate or methyl ethyl ketone and 203 is proposed as a substitute for normal butanol and its equivalents.

* * *

A NEW form of furnace safeguarding equipment making use of the luminosity of the flame instead of its conductivity has been devised by Elcontrol, Ltd., London. It is of photo-electric type and is particularly suitable for use with oil burners. This and the company's other furnace safeguard unit, the probe type of equipment (FSC) intended for gas burning installations are compared in data sheet D.3, now available.

RECOMMENDED reagents and techniques for qualitative mineral analysis are given in the fourth report by the commission Internationale des Réactions et Réactifs of the International Union of Pure and Applied Chemistry. The report, divided



By Courtsey of Chamberlain Industries, Ltd.

Staffa ratchet bending attachment

into two sections dealing with cations and anions, is edited by Dr. P. E. Wenger and Prof. Y. Rusconi.

* * *

THE ample technical and other descriptive matter issued by U.S. chemical trading groups is called to mind by the catalogue of surface active agents and organic chemical specialities issued by the Abrosi Chemical Co., Providence, Rhode Island. Among the new products listed are: Alrolenes, detergents for use in petroleum and chlorinated solvents; Alrosept MBC-50, an economical quarternary ammonium germicide; and Alrosperse 40K, an alkyl naphthalene sulphonate dispersing agent.

* * *

A SHORT but far-ranging survey of practical data about tinplate, is offered to buyers and users in the "Tinplate Handbook," by W. E. Hoare, B.Sc. (Eng.), F.I.M., A.I.P.E. (the Tin Research Institute, Greenford). Steelmaking and tinning processes used in the manufacture of both hot-dipped and electrolytic tinplate are summarised and the factors which determine the suitability of various types of tinplate for any particular application are discussed. There is also a useful English-French-German-Spanish glossary of technical terms of the trade.

* * *

THE importance of nickel alloys in aircraft construction is emphasised in a booklet issued by the Mond Nickel Co., Ltd., London, "Nickel Alloys in Gas Turbines." Nimonic alloys are used for rotor blading of every British aero engine gas turbine in production. Other parts made in one or other of the Nimonic series of nickel-chromium alloys include combustion chambers, turbine entry ducts, nozzle guide vanes and rings, high-temperature bolts.

OVERSEAS CHEMISTRY AND INDUSTRY

FRENCH CHEMICAL TRADE TOTALS

Fertilisers the Largest Export Group in 1949

CHEMICAL manufactures form one of the most active sections in French export trade taken as a whole, having established a substantial balance of exports over imports.

The effect of price increases in comparing 1949 with 1948 is comparatively small (no more than 10-15 per cent), so that last year's totals of chemical exports and imports—61.8 and 30.8 milliard francs, respectively, reflect a substantial advance. The pre-war export volume, however, has not yet been attained, if price increases since 1938 are taken into account. Despite the preponderance of exports over imports the chemical share of total exports is not quite so large—8 per cent in 1949 and 10 per cent in 1938.

The principal countries concerned in the French chemical trade and values of business in 1948-49 were as follows (in Fr.1 million). Imports (1948 figures in brackets): U.S.A. 8300.1 (5047.4); Switzerland 2958.0 (2544.4); Great Britain 2555.7 (2096.5); Germany 2375.8 (2008.9). Exports (1948 figures in brackets): Great Britain 4385.9 (1817.5); Sweden 4443.4 (2524.6); Netherlands 4142.1 (2445.8); Switzerland 3785.7 (2289.8); U.S.A. 1116.4 (1472.0) and among the French possessions Algeria 6036.9 (4451.1).

Predominance of Potassium

In the largest class of exports—fertilisers—potassium salts accounted for more than half the value in 1949, namely, Fr. 8342.7 million. Phosphates amounted to Fr.4648.6 million, while exports of nitrogen fertilisers were by comparison almost negligible.

In the heavy chemical field France is well equipped for exports, especially in alkalis. Principal exports are: soda ash, caustic soda, soda lye, aluminium oxide, caustic potash, sodium sulphate, calcium carbide, Ca, Ba, and Mg chlorides, Na and K chlorates, for which the best customers are Holland, Switzerland, Algeria, Belgium-Luxemburg, Argentine, England, and Morocco.

Exports of sulphuric acid are small—2782 tons in 1949 compared with 7894 tons pre-war. Most of the output is used at home and production has declined slightly during the last year or two. Other important products in the heavy chemical group are sulphur, bone black, hydrochloric, nitric, and phosphoric acids.

Chlorine manufacture has advanced considerably, to a total of 68,800 tons in 1949. By the end of the Marshall aid period, it is planned to increase output to 150,000 tons. Calcium carbide production, despite a small decline last year, is also on the upgrade. It is planned to increase output from 168,700 tons (the 1949 total) to 325,000 tons within the next two or three years. Chlorates and perchlorates have exceeded the pre-war level by a wide margin. Tabulated details for all leading inorganic chemicals in French production and trade are given by Dr. A. Metzner, Frankfurt, in *Chemische Ind.*, 1950 *2* (9), 458-461. Details of the organic and other sections will be published later.

EXPORTS BY CHEMICAL GROUPS IN 1949
(Frs. Million)

	Foreign Countries	French Dominions	Total
Inorg. heavy chemicals	9,618.0	2,719.4	12,337.4
Fertilisers	11,097.2	2,584.0	13,681.2
Org. heavy chemicals	2,727.8	389.7	3,117.5
Pharmaceuticals ...	4,183.2	4,217.9	8,401.1
Essential oils, perfumes, cosmetics ...	5,261.2	1,569.3	6,830.5
Org. dyes, colours, tanning materials, wood distil. products	5,129.6	825.3	5,459.4
Mineral colours and varnishes	499.7	1,455.9	1,955.6
Explosives, matches, etc.	197.1	570.6	767.7
Photochemical products	1,419.2	534.5	1,953.7
Plastics	554.4	183.7	738.1
Soaps, candles ...	1,024.9	2,048.9	3,073.8
Miscellaneous ...	1,649.8	1,449.5	3,099.3

IMPORTS AND EXPORTS RATIOS
(Fr. Milliard)

	1938	1947	1948	1949
Total imports	46.8	397.2	672.6	921.8
Total exports	30.6	223.3	434.0	782.0
Imports excess	16.2	173.9	238.6	139.8
Chemical exports ...	3.2	23.5	40.2	61.8
Chemical imports ...	1.7	15.4	20.5	30.3
Surplus of exports ...	1.5	8.1	19.7	31.5

Lignite Discovered in Austria

Deposits of lignite, estimated at between 25 and 30 million metric tons, have been discovered recently at Wolkersdorf, Carinthia, in the British zone of Austria. The depth of the deposit varies between 30 and 550 ft. It is expected that a daily output of about 2000 tons will be achieved during the next four years. Funds are being advanced by the ERP authorities.

GERMANY'S SYNTHETIC PETROL & RUBBER

Future of the I.G. Farben Factories

ECONOMIC experts of the U.S. High Commission in Frankfurt have let it be known that the Federal Republic is likely to be allowed in the near future to resume the production of synthetic motor fuel as well as buna rubber and a number of chemicals hitherto banned. They added, however, that only the production of limited quantities of synthetic fuels would be permitted, at least for the time being. This anticipated the decision of the Foreign Ministers' conference in New York.

As far as buna rubber is concerned, production possibilities in Western Germany in any case, are limited. Germany's largest wartime plant—the 70,000 ton works at Schkopau in the Soviet zone—has been working for some considerable time, though at a greatly reduced rate, but its output is not available for German consumption. In Western Germany there are two big works at Huels—whose former capacity was about 40,000 tons a year—and Ludwigshaven—30,000 tons. The buna installations at Ludwigshaven have been almost completely dismantled and at Huels, where one out of eight buna mills is still in position, an estimated DM.1 million would be required for investments to achive an annual production of 6-7000 tons of buna rubber. At Ludwigshaven the necessary re-investments would be much larger, and a considerable time would elapse before any worthwhile output could be expected.

Motor Fuels

The resumption of production of synthetic motor fuels in idle hydrogenation and synthesis plants is, as experience has shown, a much simpler proposition. The hydrogenation plant at Scholven, for instance, for which permission for resumption operations using mineral oils was granted on September 1, at first only for the treatment of crude benzol, is to be ready for operations in this limited field within eight weeks from the date of the receipt of the licence. Hydrogenation proper, on the basis of mineral oils, could start in about six months, according to expert calculations.

Economic considerations, however, do not favour oil-from-coal production in Germany. Apart from the fact that Ruhr coal is more expensive in relation to imported petroleum than before the war and is easily marketable, there is no overriding necessity to economise on imports of mineral oils. Because of this the majority view in Germany now is that the available hydrogenation capacity should be employed on treating crude oil. The domestic crudes from Emsland, which yield about 65 per cent of motor fuels if subjected to ordinary refining, can be made to yield approximately 90 per cent of motor fuels by hydrogenation.

Improved F-T Processes

Similarly, the special advantage of the Fischer-Tropsch plants before the war, *i.e.* their ability to provide an alternative outlet for coke when demand from the iron industy flags, is of little practical importance now. Nevertheless, Lurgi and others have worked on improvements of the process since the war, and certain processes of the Fischer-Tropsch plant have, in fact, been improved. The cobalt contact is being replaced by iron, and important improvements are also said to have been effected in the apparatus used. Attention has been paid in recent years to low-temperature carbonisation, with special regard to the production of such byproducts as phenols. An experimental plant using the Brennstofftechnik process was put into operation near the Langenbrahm mine at Essen a few months ago.

The first new successor companies under the I.G. Farbenindustrie law are to be set up before the end of this year, according to statements of the Allied High Commission, which maintain that the new companies will be quite capable of holding their own in competition with foreign chemical manufacturers. This view is strenuously opposed by the German critics of the law, who point to existing combines in the chemical industries of other countries as evidence of an allegedly inevitable and economically necessary tendency towards big units in chemical production. They pay no regard to the existence of special factors in the case of the German chemical industry.

All agree that the various I.G. Farbenindustrie units should be operated as efficiently as possible, but there are wide differences of views as to the best means of obtaining optimum efficiency. A number of I.G. Farbenindustrie patents in which the successor companies are not interested will be allowed to lapse unless the inventors wish to take them over.

NEW INDIAN PROJECTS

More Research and Production

THE Madras Government, recognising the importance of research in the development of industries, has sanctioned the establishment of a chemical testing and analytical laboratory to study processes for the fuller utilisation of the minerals and other raw materials available in the State.

The Government is also taking action towards establishing major industries like textiles, sugar, cement, vanaspathi and chemicals. The target for the expansion of sugar production in the State has been fixed at 120,000 tons a year, and for this ten sugar factories will be started. Ten vanaspathi factories will be started in Madras State, besides the two already working.

In the chemical industries, proposals have been made to start soda ash factories in the Tinnevelly, Guntur, Madura and Ramnad districts. At present there is only one factory in Madras State which produces caustic soda.

To augment petrol supplies, the Government has a programme for the installation of four power alcohol plants as adjuncts to the sugar mills at Vizagapatam, Bellary, Krishna and South Arcot districts. In regard to certain industries of all-India importance, such as iron and steel, magnesium and magnesium products, aluminium and ammonium phosphate, Madras has been urging on the Government of India the need to establish some of these industries in Madras.

The need for fertiliser plant and special advantages of the Mysore Government project have been emphasised by the Mysore Minister of Finance.

During the first half of 1950 alone, 400,000 tons of fertiliser have been imported, which suggests that, at the least, India's annual demand is 800,000 tons. The capacity of the Sindri fertiliser factory, now being completed, is only 350,000 tons and of Alwaye, 100,000 tons.

Diminished Chemical Output

India's output of certain important industrial chemicals in the first half of 1950 was as follows: sulphuric acid 49.5 thousand tons, compared with 89.0 thousand tons in the corresponding period of 1949; caustic soda 5.27 thousand tons (6.20); soda ash 23.55 thousand tons (17.91); liquid chlorine 2.15 thousand tons (2.61); bleaching powder 1.59 thousand tons (2.35); bichromates 0.90 thousand tons (1.79).

FERTILISER SUPPLEMENT

100,000 Tons for Ireland

THE Minister for Agriculture in the Republic of Ireland has arranged for the immediate importation of 100,000 tons of superphosphate, of 44 per cent water-soluble phosphate content. Low prices to users are to be quoted as an inducement to apply the superphosphate early. They will be revised at the end of the year. This importation is additional to normal supplies of Irish produced and imported superphosphate and takes account of the unsettled state of world affairs. The Minister has appointed as his agents for this superphosphate the Irish Sugar Company, of Dublin.

* * *

ONE of the most up-to-date margarine factories in Europe is going into production in the autumn at Drogheda, Eire. An important feature of the factory is that the entire process of manufacture is continuous from the moment the oil is pumped into glass-lined storage tanks to the emergence of packets from automatic wrapping machines. Details of the new factory, and an historical sketch of the McDonnells to whom it belongs, is given in the autumn issue of " Progress " (Vol. 41, No. 228), the magazine of Lever Brothers and Unilever, Ltd.

Dunlop Enterprise in Ceylon

A RUBBER factory in Kalutara and another in Avissawella, Ceylon, are to be opened shortly by Dunlop Plantations, Ltd. Land has been purchased at Kalutara as a site for the factory which will turn out all types of rubber goods.

The first all-rubber and canvas-rubber shoes to be made locally will be in the market early next month. The producing plant, near Colombo, is sponsored by the Ceylon Shoe Co., Ltd., and employs only Ceylon capital.

India Relaxes Import Licensing

The Indian Ministry of Commerce has announced further relaxation in the licensing of imports from soft currency countries. Licences are now freely available for the import of German and nickel silver, insulating materials, coal tar dyes, asphalt and gilsenite. Polystyrene may also be imported from any currency areas.

Lower Aluminium Production

Indian aluminium production, which rose to 3486 long tons in the first half of 1949, declined to 1698 long tons in the corresponding period of this year.

· OVERSEAS ·

Israel's First Asbestos Works

The first Israeli asbestos company has been established in Tel-Aviv with an initial share capital of U.S. $500,000. The daily output is planned to be some 9000 sq. m. of sheet.

U.S. Sulphur in July

The U.S. Bureau of Mines reports that 466,063 long tons of native sulphur were produced during July, 1950. This continued high level of production brought the total for the first 7 months of 1950 to 3,009,506 long tons. Apparent sales were calculated at 446,469 long tons, and at the end of July producers' stocks were 2,975,927 long tons.

Copper Sulphate Protection Proposal

Another appeal for protective legislation by chemical producing interests in India, the makers of copper sulphate, is receiving the consideration of the Indian Government Tariff Board. The board will consider representations from industries likely to be affected, consumers and producers of copper sulphate outside India. The Commercial Relations and Exports Department of the Board of Trade has expressed willingness to assist in making known the views of U.K. producers.

High Acid Resistance

Describing the exceptional resistance of phenolic resin products to most industrial chemicals up to temperatures of 375° F., Dr. R. B. Seymour (Atlas Mineral Products Company) told the recent annual meeting of the American Chemical Society about a phenolic resin-lined tank which had already surpassed the endurance which could be expected of stainless steel. After a daily charge of 100,000 gal. of boiling sulphuric acid, for steel pickling, the tank was "completely unaffected."

Argentina Safeguards "Critical Materials"

To curb profiteering and hoarding, the Argentine Ministry of Industry and Commerce has compiled a list of "critical materials" which cannot be disposed of without informing the government. Stocks, sales and prices of such materials must be declared at specified intervals. The list includes: Citric acid, arsenic, benzol, Solvay soda, quinine, caustic soda, rubber, scrap iron, steel, wire, cables, pipes, aluminium, nickel, copper, tin, chromium, magnesium, zinc, mercury, lead, uranium and asbestos, electrical equipment, meters, and motors.

Exploiting Sicilian Minerals

A company with large U.S. participation is being established in Sicily with the object of exploration and exploitation of the mineral wealth of central parts of the country.

Venezuela Iron-Ore Production

The U.S. Department of Mines has announced that iron ore from the high-grade deposits recently developed by the Bethlehem Steel Corporation at Cerro, Bolivar will be extracted for shipment to the U.S.A. at the rate of 13 million tons per annum by 1953.

Alkali Search in Western Australia

Temporary reserves of 5000 sq. miles in Western Australia are being granted by the Government to the Australian Mining and Smelting Company, of which Vacuum Oil and Zinc Corporation are the principal shareholders. The reserves are required to search for alkali and alkaline earth minerals, including sodium, barium and calcium.

Malayan Search for Uranium

The possibility that payable deposits of uranium may exist in the F.M.S. is stated in the annual report of the Malayan Geological Survey Department. Miners have been urged to watch for green flakes of torbenite, a uranium-bearing mineral. The report also suggests that some lode deposits might yield tin ore and uranium ore as a by-product.

Antarctic Whaling Expedition

The first of 10 Norwegian whaling expeditions has set sail for the Antarctic. Led by the factory ship *Kosmos IV* it comprises 14 catcher boats and a complement of 550 men. Four British and South African expeditions, two Japanese, one Russian and one Dutch, with further parties from Norway, are expected to join the *Kosmos IV* later.

U.S. Steel Capacity

Ingot capacity of the American steel industry is to be expanded by 9.4 million tons (annually) between July 1 last and the end of 1952. The new total will then be 109,963,000 tons, compared with 82.8 million in 1941, and 94 million at the peak period of 1944. Steel production last week was 1,942,200 tons and a record output of 1,951,900 is expected from this week, according to the American Iron and Steel Institute.

· PERSONAL ·

MR. A. R. McBAIN, a part-time member of the Southern Gas Board, has been appointed a part-time member of the Iron and Steel Corporation of Great Britain, to fill the vacancy created by the decision of Mr. R. A. Maclean that he could not sincerely participate in the scheme to nationalise much of the iron and steel industry. Mr. McBain, who is 63, is appointed for six months. He is a former under-secretary of the Ministry of Supply, in the department of munitions supplies.

New Fellowships for chemical research for 1950-51 have been awarded by the trustees of the Ramsay Memorial Fellowships as follows:—

MR. EDWARD GELLES, a British Fellowship of £500 a year at University College, London; DR. R. W. A. ATTREE, a Canadian Fellowship, at the University of Bristol; MISS M. J. MOLERA, a Spanish Fellowship at Oxford University. Four Fellowships also have been renewed for 1950-51.

SIR HERBERT MERRETT, deputy chairman of Powell Duffryn, Ltd., has agreed to become chairman of the company on the retirement of MR. EDMUND LAWRENCE HANN, who has held that office for more than 22 years. Lt.-Col. C. H. C. GUEST, director, is retiring from office, being over the age limit.

MR. J. C. CHRISTOPHERSON, sales director of Albright & Wilson, Ltd., and MR. K. A. M. BARTON, are among the directors of Midland Silicones, Ltd.

MR. KENNETH G. HOLDEN, chairman of Hardman and Holden, Ltd., Manchester, has been appointed a director of the Royal Bank of Scotland.

The retirement from the board of the General Electric Co., Ltd., of MR. MAURICE SOLOMON because of continued ill-health, brings to an end a fruitful collaboration which has continued since 1903. That was the year in which he joined the General Electric Co., Ltd., after a short period with Johnson Matthey & Co., and the Nernst Lamp Co., to work in the experimental department of the Robertson Lamp Works. Mr. Solomon became a director in 1915 and in 1920 became managing director of Pirelli-General Cable Works, Ltd., which he continued to direct until 1928. His rapid and sustained success was aided by an exceptionally clear mind, which enabled him to make a logical approach to all problems, and his great capacity for lucid exposition.

SIR WILLIAM COATES has retired, at the age of 68, from Imperial Chemical Industries, Ltd., with effect from the end of September. He has been a director of the company for 21 years and a deputy-chairman for five.

SIR JOHN GREEN has been nominated as deputy chairman of the Iron and Steel Corporation of Great Britain. He resigned from the boards of Thos. Firth and John Brown, Ltd., and Firth Brown Tools, Ltd., and from his executive offices on September 30.

For heroic rescue, at the risk of his life, of a colleague (Mr. Charles Clack), following an explosion at the works of the Northern Aluminium Co., Ltd., Banbury, on May 18, MR. JACK BROWN has been awarded the George Medal.

MR. W. B. EASTON has been appointed to the board of James North & Sons, Ltd., manfucturers of PVC protective clothing. He was for many years general manager and latterly a director of Textproof (of Salford), now part of the J. B. Broadley organisation.

MR. W. S. STEEL has been appointed a director of the British Thomson-Houston Co., Ltd., as from October 2. He went to South Africa in 1937 as engineering representative of the BTH organisation, and for two years during the war held various technical appointments under the U.K. Government. He returned to BTH in September, 1943, and in December, 1946, was appointed manager of BTH home sales and in May, 1948, was elected a director of the British Thomson-Houston Export Company.

MR. R. E. G. WINDSOR, 27 year-old managing director of R. H. Windsor, Ltd., London, E.C.2, and South Chessington, Surrey, the makers of plastic injection moulding and extrusion machines, left London airport on September 30 for a six-weeks' business trip of 30,000 miles with his fellow directors, MR. F. T. WRIGHT, and COMMANDER F. C. FELLOWES-GORDON. One of the purposes of the tour is to conduct a plastics fact-finding mission in India and Pakistan, which the director considers have big potentialities for trade. The company has recently established a new sales company in Bombay, R. H. Windsor (India), Ltd. Mr. Windsor will also be visiting Australia, and later, in Tokio, he will address members of the Rubber and Chemical Society in Japan.

• HOME •

Overseas Letter Rate Increased

The minimum foreign letter rate of postage has been increased from October 1 from 3d. to 4d. This rate applies to virtually all countries except the British Commonwealth, U.S.A., Burma, Egypt, Israel and Jordan.

Tin Prices Rally

After a firm start, with a settlement price of £811 on September 26, tin became easier with a settlement of £780 at the closing session on September 29. The market was stronger on October 2 when tin recovered on the London Metal Exchange, with a settlement price of £804—an increase of £24.

"C.A." Back Issues

THE CHEMICAL AGE has received a request from the Chinese Society of Chemical Industry for a number of past issues of this journal, which are not now available. The co-operation of readers is invited to provide copies of THE CHEMICAL AGE of the following dates: 1948—July 2, September 10, October 22, November 12; 1950—March 4.

New Distillation Plant

The South Eastern Gas Board is to install a new modern tar distillation plant at its Ordnance Wharf Byproducts works. It will be capable of dealing with 200 tons of tar every 24 hours and will produce seven oil fractions simultaneously, together with two qualities of pitch. A contract to build the plant has been placed with Wilton's Patent Furnace Co., Ltd., Horsham, Sx.

Wolfram Supplies and Prices

The price of wolfram (nominal) last week reached a new peace-time record of nearly 250s. a unit. Supplies are short, partly due to involuntary accumulation in Burma due to transport problems. Portugal dominates the market and there have been offers of odd lots from Bolivia. Supplies from South Korea an important source before the fighting, may be resumed, with U.S. assistance.

Zinc Prices Revised

Changes in the prices of zinc (per long ton delivered) as from October 1 were announced by the Ministry of Supply this week as follows: GOB. Prime Western and debased £151 (£147 10s.); refined and electrolytic £155 (£152); not less than 99.99 per cent purity £157 (£158). Prices of zinc oxides in lots of not less than 2 tons delivered, were raised by £8 from October 2. New prices are: Red seal, £189 10s.; Green seal, £141; White seal, £142.

Costly Rubber Raises Tyre Prices

The price of car, commercial vehicle and agricultural tyres rose on Monday by 17½ per cent, cycle tyres by 12½ per cent, and aircraft tyres by 25 per cent. Retreading prices were correspondingly increased.

£10,000 Glass Plant for Overseas

A single overseas order requiring nearly £10,000 worth of plant has been received by Quickfit and Quartz, Ltd., makers of chemical and laboratory glassware. This was disclosed by Sir Graham Cunningham, chairman of the Triplex Safety Glass Co., Ltd., of which Quickfit and Quartz is a subsidiary, at the Triplex annual general meeting held in London.

Dundee Grant for Jute Research

The British Jute Trade Research Association has made to University College, Dundee a grant for two years to encourage the college to undertake research work on the fundamental structure of jute and allied fibres. The work is designed to clarify certain details of chemical properties of the structure of jute and allied fibres, supplementing the applied research which has been performed by the BJTRA

Technical and Scientific Register

The total enrolled on the Technical and Scientific Register at August 14 was 5642. This, states the September issue of the *Ministry of Labour Gazette*, included 3204 registrants already in work but who desired a change of employment, 858 students provisionally enrolled, and 1580 registrants who were unemployed. During the period July 11 to August 14 (five weeks) 531 vacancies were notified, 331 were filled and 475 cancelled or withdrawn. Vacancies outstanding at the end of the period were 3763.

Laboratory Equipment as Dollar Earner

The important contribution to the growing volume of trade with Canada made by specialised technical products is recalled by a statement this week that Baird and Tatlock (London), Ltd., has been chosen by the Canadian Government to equip the laboratories of the Canadian Research Council in Ottawa, and to provide BTL metal unit furniture throughout. The order represents earnings of approximately Canadian $220,000 and supplements an earlier order for laboratory equipment for the Department of Health, Ottawa, on which work is now proceeding.

The Stock and Chemical Markets

CAUTION has been evident in stock markets this week, although the big increase in the sterling area's gold and dollar reserves helped sentiment, particularly in the gilt-edged section where 3½ per cent War Loan touched the highest level this year. The freeing of the Canadian dollar had the effect of causing a moderate decline in some dollar stocks. Because Canada is an important link between the sterling and dollar areas, the freeing of the Canadian dollar has given rise to renewed talk that the £ sterling might be revalued to the equivalent of 3 dollars. Early this week this rumour caused a setback in Kaffir gold mining shares, (a higher value for sterling would mean a reduction in the price of gold).

Industrial shares were steady, but quiet, partly because of caution and a tendency to observe pronouncements at the Labour Party conference for any clues as to Government policy. Among chemicals, Imperial Chemical were little changed at 42s. 4½d., Laporte Chemicals 5s. ordinary 10s. 6d., Brotherton 10s. shares 20s. and Albright & Wilson were 30s. 6d., with the latter company's new 5 per cent preference at 1s. 6d. premium. Monsanto were firm at 51s., Boake Roberts were 30s. 3d., Amber Chemical 2s. shares 2s. 9d., while F. W. Berk have strengthened to 11s. and Bowman Chemical 4s. shares were 5s. 3d. W. J. Bush were 85s. 6d. and the 5 per cent preference 22s. 9d. British Glues and Chemicals eased to 21s. 3d., although the company has important business in Canada. Turner & Newall again remained active on higher dividend talk, and firmed up to 84s. 9d., while United Molasses were steady at 46s. 6d. and the 4s. units of the Distillers Co. active around 19s. 9d.

Triplex Glass were prominent with a rise to 27s. 1½d. and United Glass Bottle went up to 76s. 10½d. Glaxo Laboratories, on the company's record earnings and 17½ per cent dividend on the capital increased by last year's 900 per cent share bonus, moved up to 51s. Boots Drug have been active around 50s., Borax Consolidated were steady at 55s., Associated Cement firm at 85s. 6d. and Lever & Unilever rose to 42s. 10½d.

The latter company's £10 million debenture issue has been entirely successful, and the City has been talking of a premium of up to £1 over the issue price when dealings start. Many more important issues by leading industrial companies are likely.

Iron and steels showed small irregular movements. There was further selling by holders not wishing to take up the new steel stock, which however, cannot be created before January next at the earliest. Steel shares, however, are bought by some investors as an indirect means of acquiring an interest in gilt-edged. Of other shares, Powell Duffryn at 30s. 6d. were higher on the full results, but Staveley, however, eased to 84s. following the unchanged dividend. Dunlop Rubber were slightly higher at 61s. 9d.

Oil shares were hesitant, but turned firmer later, with Shell at 65s., Anglo-Iranian close on £6⅝ and Trinidad Leaseholds 25s. 6d. Canadian Eagle (registered and no par value) shares were steady at 28s. and 29s. respectively.

Market Reports

A FAIRLY strong tone prevails in most sections of the industrial chemical market. The only important price changes are an increase of £3 a ton in the prices of zinc oxide in lots of not less than 2 tons delivered, and the substantial increases in solvents prices, referred to elsewhere in this issue. The oxide manufacturers' new prices are—red seal £139 10s., green seal £141, white seal £142 per ton. Among the soda products, chlorate, bichromate and yellow prussiate of soda are in good request and almost all offers of the potash products are finding a ready outlet. Bookings for shipment are reported to be on a good scale and the home demand for chemicals used in the textile and plastics industries remains persistent. Pitch is in active request both for home and export account and a good demand continues for creosote oil and crude carbolic acid. The call for ADF cresylic acid is fully sustained at prices approaching 7s. per gal. *ex works*.

MANCHESTER.—The textile trades of Lancashire and the West Riding of Yorkshire are maintaining a steady demand for heavy chemical products and traders on the Manchester market during the past week have reported persistent pressure for supplies from other leading outlets. The alkalis, potash chemicals and the ammonia and magnesia compounds are mostly moving steadily into consumption and a fair amount of replacement buying has been going on. Prices generally continue strong. A fair trade in the compound fertilisers has also been reported. In the

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

FISONS, LTD., Ipswich, fertilisers manufacturers. (M., 7/10/50). September 5, £3,500,000 first debenture stock, secured by trust deed dated September 4, 1950; charged on properties and shares specified. *Nil. March 6, 1950.

HOPKIN & WILLIAMS, LTD., London, E.C., manufacturing chemists, etc. (M., 7/10/50). September 6, debenture to Industrial and Commercial Finance Corporation, Ltd., securing all sums to be paid by the company under an undertaking and guarantee; charged on properties and a general charge. *Nil. April 19, 1950.

TIMOTHY WHITES & TAYLORS, LTD., Leeds, chemists. (M., 7/10/50). September 5, security supplemental to trust deed dated July 14, 1947, charged on properties at Exeter, etc. *£1,414,360. July 27, 1950.

Satisfactions

APPLIED METAL FINISHES, LTD., Slough. (M.S., 7/10/50). Satisfaction September 6, of mortgage reg. October 25, 1946.

BAIRD & TATLOCK (LONDON), LTD., laboratory furnishers, etc. (M.S., 7/10/50). Satisfaction August 31, of series of debentures reg. May 24, 1932 and October 24, 1934.

W. J. BUSH & CO., LTD., London, E., manufacturing chemists, etc. (M.S., 7/10/50). Satisfactions September 6, of charges reg. August 5 and October 17, 1910, March 12 and 19, 1919.

Company News

Inspectors Appointed

The Board of Trade has appointed as inspectors to investigate the affairs of P. B. Cow & Co., LTD., Sir Alan Rae Smith, C.A., and Mr. K. D. Cole, solicitor.

Geo. Cohen, Sons & Co., Ltd.

Net profit of George Cohen, Sons & Co., Ltd., for the year ended March 31 is announced as £129,000. A final ordinary dividend of 12 per cent has been declared, making a total of 20 per cent for the year.

Greeff-Chemicals Holdings, Ltd.

An interim dividend of 4 per cent on account of the year ending December 31 compared with 3¾ per cent for the previous year, has been declared by Greeff-Chemicals Holdings, Ltd. This dividend is payable on November 1, to shareholders on the register on September 26.

Imperial Chemical Industries, Ltd.

An interim dividend of 3 per cent for the year ending December 31, on the ordinary stock of Imperial Chemical Industries, Ltd., has been declared. This will be payable on December 1 to shareholders on the register on October 12.

Powell Duffryn, Ltd.

The report of the directors of Powell Duffryn, Ltd., for the year to March 31 last shows that a balance of £993,067 will be carried forward (£955,404 last year) and, in respect of the subsidiary companies, £1,229,647 (£1,175,518). A final ordinary dividend of 5 per cent, making 8 per cent for the year, is recommended.

Thos. W. Ward, Ltd.

The directors of Thos. W. Ward, Ltd., on October 27 will recommend a final dividend of 10 per cent, less tax, on the ordinary share capital, making 15 per cent, less tax, for the year ended June 30, 1950.

Increase of Capital

The capital of Beecham Research Laboratories, Ltd., has been increased from £100,000 to £200,000.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

market for the tar products the benzols and xylols are in good demand and a steady trade continues on the American cresylic acid account.

GLASGOW.—Business in general in the Scottish chemical market is fairly steady. Export business has been a little more active recently, but many of the products which were being exported two to three months ago are no longer available for shipment.

Next Week's Events

MONDAY, OCTOBER 9

Incorporated Plant Engineers

Maidstone: The Old Palace, 7 p.m. Kent Branch. Ingersoll Rand Co.: "The Use of Compressed Air in Industry."

Dundee: Mathers Hotel, 7.30 p.m. H. W. L. Tuckey: "Industrial Heating and Choosing the System."

The Chemical Society

Portsmouth: Municipal College, 7 p.m. (with RIC). Prof. H. J. Emeleus: "The New Elements."

TUESDAY, OCTOBER 10

Incorporated Plant Engineers

Manchester: Engineers' Club, Albert Square, 7.15 p.m. East Lancs. Branch. Film: "Ultra High Speed Photography," by Kodak, Ltd.

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. A. J. Philpot: "The British Scientific Instrument Manufacturers Research Association."

Institution of Works Managers

Liverpool: Adelphi Hotel, 6.30 p.m. C. P. Gourley, H.M. Superintending Inspector of Factories: "The Factories Act, 1948."

Institution of Chemical Engineers

London: Institution of Civil Engineers, Great George Street, S.W.1, 5.30 p.m. J. Arthur Reavell, chairman of the drafting committee, will open a discussion on: "The Provisional British Standard Code 1500:1949 for Fusion-welded Pressure Vessels for Use in the Chemical and Allied Industries."

WEDNESDAY, OCTOBER 11

Society of Chemical Industry

London: Medical Society of London, 11 Chandos Street, Cavendish Square, W.1, 8 p.m. Microbiological Panel, symposium on: "Air Disinfection and Sterilisation." Programme: C. E. Coulthard—Introduction; Dr. O. M. Lidwell: "Methods of Sampling Air for Micro-organisms"; Dr. R. E. O. Williams: "Methods of Disinfecting Air by Chemical Agents or Ultra-violet Light"; Dr. A. Parker and G. B. Cherry: "The Removal of bacteria from Air by Filtration and its Application to Industrial Fermentations"; F. E. S. Wright: "Large Scale Filtration and Ultra Violet Irradiation for Purification of Air Supplies"; Dr. R. B. Bourdillon to open the discussion.

Royal Institute of Chemistry

Slough: Afternoon visit to Pest Infestation Laboratory. Grammar School, 6.30 p.m. W. Burns Brown: "Factors Affecting the Distribution of Fumigants."

Salford: Royal Technical College, 6 p.m. Student members' annual general meeting, and display of electronic instruments. J. T. Marsh: "The Work of the Institute."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. E. J. Heeley (presidential address): "A Metallurgist in the Chemical Industry."

Association of British Chemical Manufacturers

London: Grosvenor House, Park Lane, W.1, 7 p.m. Annual dinner.

THURSDAY, OCTOBER 12

Royal Institute of Chemistry

Acton: Technical College, High Street, W.3, 7 p.m. J. E. Johnston: "Radioactive Isotopes, their Production in Atomic Piles and Some Industrial Uses."

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. J. Shorter and C. N. Hinshelwood: "The Kinetics of the Oxidation of Organic Compounds—Parts I and II"; P. Davis, M. G. Evans and W. C. E. Higginson: "Some Oxidation-reduction Reactions of Hydroxylamine"; C. E. H. Bawn and A. G. White: "Reactions of the Cobaltic Ion. Parts I, II, and III."

Oil & Colour Chemists' Association

Cheetham: Town Hall, 6.30 p.m. Third post-graduate lecture. Dr. A. S. C. Lawrence: "Topics in Colloid Chemistry."

Society of Dyers and Colourists

Manchester: Gas Showrooms, Town Hall extension, 6.30 p.m. Dr. W. W. Barkas: "The Swelling of Fibres."

Society of Glass Technology

St. Helens: Gas Showrooms, Radiant House, 6 p.m. Prof. W. E. S. Turner: "The Chemical Durability of Glass."

FRIDAY, OCTOBER 13

The Chemical Society

Bangor: University College of North Wales, 5.45 p.m. Professor T. S. Wheeler: "Studies in the Synthesis of Flavones."

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5 p.m. Dr. W. J. Dorling: "Research in the Paint Industry."

Swansea: University College, 5.30 p.m. (with RIC). Prof. F. Challenger: "Some Aspects of the Chemistry of Sulphur Compounds Occurring in Nature."

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Lower alkyl esters of N-acylamino aliphatic carboxylic acids.—Merck & Co., Inc. June 12 1947. 644,915.

Process for preparing chloral alcoholate or chloral.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 27 1947. 644,916.

Burner adapted to burn either liquid or gaseous fuel.—Combustion Research & Development, Inc. July 3 1947. 644,785.

Production of photographs in blue-black tones.—General Aniline & Film Corporation. July 8 1947. 644,788.

Extraction of dangerous gases from mines.—M. Parry. July 15 1948. 644,869.

Solvent extraction of glycerides and of fatty acids derived therefrom.—Pittsburgh Plate Glass Co. July 21 1947. 644,917.

Manufacture of protein hydrolysates.—Raptakos, Brett, & Co., Ltd., and G. B. Ramasarma. July 25 1947. 644,918.

Method of producing bio-synthetic antimicrobial substances.—Upjohn Co. July 29 1947. 644,919.

Production of polyolefinic hydrocarbons.—Universal Oil Products, Co. Aug. 6 1947. 644,873.

Sulphonamido pyrimidines.—Sharp & Dohme, Inc. Aug. 7 1947. 644,702.

Method of obtaining hydantoins.—Parke, Davis & Co. Aug. 7 1947. 644,800.

Production of dicarboxylic acids or anhydrides thereof.—California Research Corporation. Aug. 7 1947. 644,920.

Styrene co-polymers.—Pinchin, Johnson & Co., Ltd., L. W. Coveney, S. L. M. Saunders, and D. Schiller. Sept. 8 1948. 644,877.

Adhesive tape having a cleanable backing.—E. I. Du Pont De Nemours & Co., Aug. 14 1947. 644,803.

Manufacture of cellular material from clays or similar silicates.—A. Frokjaer-Jensen. Aug. 20 1947. 644,636.

Process and apparatus for coating surfaces with plastic and other semi-liquid composition.—A. H. Hawes. Aug. 28 1948. 644,638.

Manufacture of metalliferous azo-dyestuffs.—Ciba, Ltd. Sept. 29 1947. 644,883.

Production of sulphuric acid.—Imperial Chemical Industries, Ltd., and H. A. Edge. Oct. 1 1948. 644,924.

Production of terephthalic acid.—Gas Light & Coke Co., R. H. Griffith, J. H. G. Plant, and J. O. H. Newman. Sept. 30 1948. 644,707.

Anodic treatment of aluminium and aluminium alloys.—Soc. Anon. Pour la Protection et la Coloration des Metaux, Trefileries et Laminoirs du Havre, and J. F. G. Herenguel. Oct. 27 1947. 644,887.

Process of preparing 7-dehydrosterol esters from 7-halogensterol esters.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Nov. 21 1947. 644,891.

Manufacture of artificial resins.—Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. Dec. 29 1947. 644,894.

Manufacture of insecticidal solutions.—J. R. Geigy Akt.-Ges. Dec. 29 1947. 644,895.

Production of pseudo-alloys. — D. Primavesi. Dec. 29 1947. 644,813.

Protection of gelatine and other colloid layers.—Kodak, Ltd. Dec. 31 1947. 644,814.

Manufacture of disazo dyestuffs.—Imperial Chemical Industries Ltd., and F. P. Reed. Jan. 31 1949. 644,897.

Treatment of rubber.—Dunlop Rubber Co., Ltd., W. C. Davey, F. A. Jones and P. L. Bradshaw. Jan. 4 1949. 644,931.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Scientific Exchanges

AS the number of their published reports multiply, the technological teams from British industry which have visited America have acquired a revived interest, comparable with that aroused when the "sharing" principle was just announced. There is a danger that many people will assume that this kind of international co-operation is a new idea, something given significant existence by the statesmen who formed the Anglo-American Council on Productivity. These recent Anglo-American interchanges are in fact no more than particular examples of a process of international discussion long fostered and supported by British science. Of that there is abundant evidence, some of the most recent examples of the international outlook of British research being the reports (for 1949) of Rothamsted and Long Ashton, two of the principal agricultural experiment stations. These two publications reveal a remarkable development of world co-operation and of very rewarding scientific "globe-trotting".

During 1949, Sir William Ogg, director of Rothamsted, visited research stations in America and Canada. Dr. Muir, head of the Pedology Department of the Soil Survey for England and Wales, spent several months in Canada and the United States studying soil survey methods used in those countries. Members of the Plant Pathology Department were seconded for urgent work in Zanzibar to deal with the "sudden death disease" of clove trees; a member of the Pedology Department gave a course of lectures in Spain and Rothampsted was represented at international conferences in America, Australia, Belgium, Holland, France, Switzerland, Denmark, and Turkey. The chemistry department continued to study problems of fertiliser use for rubber plantations in Malaya and oil palms in Nigeria and the Belgian Congo.

The Long Ashton record is equally impressive, possibly more so, allowing for the fact that Long Ashton is a considerably younger and a rather smaller centre. Professor T. Wallace, the director, spent several months in Australia and New Zealand, contacting all the principal research stations, and gave numerous lectures; in Australia he was a United Kingdom delegate at the Commonwealth Specialist Conference in Agriculture and chairman of one of its sections. These two tours occupied four months. Dr. Hubert Martin, whose 1950 appointment to an important research post in Canada was recently announced, spent several weeks in Zanzibar, also in connection

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970) MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

with the "sudden death disease" of cloves. Mr. R. W. Marsh, senior mycologist, exchanged duties with a Canadian mycologist and for twelve months studied the development of fungicides at more that 40 research stations in Canada and America, while Dr. Willison, the Canadian specialist on virus diseases of tree fruits, made Long Ashton his base for studying virus problem in English orchards.

It should not be supposed that all this international activity was a "one-way traffic". The Long Ashton report gives the names of 57 well-known overseas scientists who visited the station for varying periods during 1949. They were not merely from the Commonwealth or the U.S.A.—whose many emissaries included their Under-Secretary for Agriculture—but from the world. At both centres the stream of overseas visitors has been almost embarrassingly large. Sir William Ogg expresses regret that many applications for temporary post-graduate accommodation at Rothamsted have had to be refused for lack of space. Workers who have to be turned away usually go to other countries for their further training and permanent research workers are deprived of the benefit of wider associations.

This co-operation has all occurred in one year and at only two of our agricultural research stations. Earlier in this century as much contact with the rest of the world's science would not have been attained in a decade. Moreover, it has taken place when Britain herself is in the middle of an expansive technical revolution in agriculture, which is seriously under-supplied with the research and advisory scientists it needs.

These exchanges are not merely of academic scientists incapable of making the immediate contribution to practical affairs expected from the industrial technologists. In agriculture the scientist almost invariably is a technologist within the true meaning of the word. The whole of his work is directly aimed at productivity—of the world's biggest industry. We have in the past too often neglected our home agriculture and in the process limited the facilities of our research stations and the rewards of their scientists. The past deterrents, however, clearly have not prevented them from maintaining world reputations or making important contributions to the soil and crop problems of all the continents.

Rothamsted Experimental Station, *Ann Rept* 1949–1950, pp 180, (5s.)

Long Ashton Research Station, *Ann. Rept.* 1949–1950, pp 174., (12s.)

Notes and Comments

New Engineering Group

THE importance of Birmingham's practical contribution to the advancement of chemical engineering, which received stimulus from the establishment at Birmingham University of a very lively department of chemical engineering, is suitably recognised by the creation there of the second provincial section of the Institution of Chemical Engineers. The inauguration of the Midland branch, which is to share with the North Western branch in Manchester the distinction of being the only organised groups of chemical engineers outside London, takes place to-day (Saturday), appropriately at Birmingham University. The university has provided a focal point for many chemical interests in the Midlands, which have long recognised the desirability of a corporate voice in forwarding the neglected interests of chemical engineers in general. From the university also comes the first chairman, Professor F. H. Garner—whose stimulating influence in its department of chemical engineering has served to emphasise the practical advantages which many provincial centres forgo, having no chair of chemical engineering—the secretary (S. R. M. Ellis) and two members of the committee of nine. By the addition of the Birmingham engineers, the Institution of Chemical Engineers will be empowered to speak on behalf of approximately 2400 members of the profession. Now, with even closer integration with the chemical engineering group of the SCI, it should have ample influence to put an end to the Cinderella rôle which chemical engineering has so long occupied in regard to national allocations for training and research.

Mineral Bonus

THE general reliability of mineral estimates in Britain, where geologists and their confreres have been active for generations, makes all the more attractive the news of mineral windfalls which flout conventional expectations. Two arresting examples, the location near Lichfield and later in the Rugeley area of coal measures sufficiently important to call for a new estimation of national coal resources, were not entirely unforeseen. One had, in fact, been suggested with remarkable accuracy many years before. Potash, on the other hand, has in this country the element of unexpectedness which compels attention from experts and all others to the recent development of some clues uncovered by an exploratory bore hole which the D'Arcy Exploration Company sank near Whitby in 1938. The quest then was for petroleum and among the results was evidence of something which, geologically, is even rarer—K_2O in the form of polyhalite, apparently in large quantity at about 4500 feet.

Expectations

A FURTHER chapter in this story, of which only a bare synopsis has been made public (THE CHEMICAL AGE, *61*, 143-145), is expected in the paper being presented in Newcastle next week (October 17) by Dr. Alexander Fleck, a director of I.C.I., Ltd., which has taken a principal part in the field and the laboratory to determine what was the significance of the original "strike". It is widely believed that Dr. Fleck is in a position to disclose some proofs much more promising than the first evidence, which related to a 15.6 per cent potash content in the deep deposits near Aislaby. I.C.I. is known to have made a number of borings in the past three years, at Aislaby and Dunsley and most recently near the beach at Whitby. Fison's, Ltd., the other leading potash user, has shared the exploratory work, at Thorpe, near Robin Hood's Bay. The existence in Yorkshire of large beds of potash-bearing materials seems fairly well established. Whether these will in fact relieve us of a fair proportion

of the heavy annual bill for overseas supplies will depend largely upon the degree of improvement made in the recovery method first proposed. That was by pumping and subsequent extraction from a brine solution.

Up to Date Textbooks

"THERE are no good textbooks; some, however, are worse than others!" This unjust verdict of a soured seeker after truth does compel recognition that there are textbooks and textbooks. Some are as up to date as it is possible to be in an age of publishing delays, printing disputes, etc.; some, alas, are not. By judicious selection, the graduate or the works chemist is generally able to buy that book which seems to him to be the most contemporary for his particular needs. But, even then, he occasionally finds that methods quoted do not work properly, there is ambiguity, the statistical data may not agree with other works of reference, and that there are other more recent techniques which are more suitable, quicker and more accurate. In no field does this apply more than in organic analysis. Here so important are the preparation of derivatives and consequent determination of melting points, etc., that the need to use the most modern methods of analysis and the newest reagents is self evident. It is accordingly heartening that a commercial firm (Hopkins and Williams, Ltd.), has taken the enlightened course of providing a new edition of its handbook "Organic Reagents for Organic Analysis", with suitable references to recent literature so that organic analysts shall have access to the latest aids. The industrial firm, with its panel of practical chemists, possesses a considerable advantage over the academic writer of text-books. A group of chemists must collectively always be more nearly omniscient than a lone worker, especially when the group consists of chemists whose every day task is to use ultra modern methods. Their vast practical experience can scarcely fail to be of great assistance to colleagues less fortunately placed.

Commemorating a Great Engineer

THE progress of science and invention and particularly man's adaption of energy to his requirements, have tended to invest the scientist and inventor with the distinction of creators not only of ideas but of their physical manifestations. Yet it was Sir Charles Parsons, one of Britain's greatest engineers, whose genius made possible the steam turbine, who pointed out that the scientist really only applies the various sources at his disposal. "We are all too apt," he said, "to look on scientific progress as purely utilitarian. We forget that we merely harness the mechanisms of creation. We create nothing." Memories of Sir Charles, to whom tribute was paid by Sir Harold Hartley in his presidential address "On Man's Use of Energy," at this year's British Association meeting in Birmingham, were recalled last week when Sir Robert Robinson, P.R.S., asked acceptance by the dean and chapter of Westminster Abbey of a memorial window, designed by Sir Ninian Comper. The window is one outcome of the Parsons commemoration organised by the Royal Society. Others are the annual memorial lecture and the contribution of £10,000 towards the Parsons Memorial Library, which Queen Mary opened at London House, Bloomsbury, in 1937. Sir Charles, who was the first engineer to receive the O.M., carried out many investigations leading to decisive changes, including work on large reflectors for telescopes and experiments in making diamonds. His great technical ability was sustained by a refusal to be deterred by formidable setbacks.

Hunterian Society Library

The Ciba Foundation for the Promotion of International Co-operation in Medical and Chemical Research in London is now providing accommodation for the library and museum of the Hunterian Society. The opening of the new premises was performed by Lord Horder at the annual party of the society held last week.

STEEL VESTING DATE ANNOUNCED

Postponement for Seven Weeks

ON February 15, 1951, all the assets of the 92 scheduled companies cited in the Iron and Steel Act, 1949, will be transferred to the Iron and Steel Corporation. News of the decision was released on October 10 by the Ministry of Supply, which observed that the Minister (Mr. G. R. Strauss), after consultation with the corporation, had decided the vesting date, which in accordance with the Act passed last year would have been January 1, 1951. Earlier, the Bill had provided that the companies, employing about 300,000, should become State property on May 1, 1950. Action by the House of Lords, however, ensured that the vesting date should not be before the General Election.

The present order—the Iron and Steel Act, 1949, (Alteration of General Date of Transfer) Order, 1950—provides that securities which are owned by listed companies or their wholly owned subsidiaries will not vest in the corporation.

The 92 companies concerned are these:—

Arthur Lee & Sons (Hot Rolling Mills), Ltd.; Bairds & Scottish Steel, Ltd.; Barrow Ironworks, Ltd.; The Beckermet Mining Co., Ltd.; Birchley Rolling Mills, Ltd.; The Briton Ferry Steel Co., Ltd.; Brown Bayley's Steel Works, Ltd.; Brymbo Steel Works, Ltd.; Burnell & Co., Ltd.; The Byfield Ironstone Co., Ltd.; The Bynea Steel Works, Ltd.; Cargo Fleet Iron Co., Ltd.; Colvilles, Ltd.; Consett Iron Co., Ltd.; The Cranford Ironstone Co., Ltd.; The Crosby Ironstone Co., Ltd.; Darlington & Simpson Rolling Mills, Ltd.; Darwen and Mostyn Iron Co., Ltd.; The District Iron and Steel Co., Ltd.; Dixon's Ironworks, Ltd.; Dorman, Long & Co., Ltd.; The Elba Tinplate Co., Ltd.; English Steel Corporation, Ltd.; The Etna Iron & Steel Co., Ltd.; Gjers, Mills & Co., Ltd.; The Glamorgan Hematite Iron Ore Co., Ltd.; The Glynhir Tin Plate Co., Ltd.; Goldendale Iron Co., Ltd.; The Gorse Galvanizing Co., Ltd.; Guest, Keen & Nettlefolds (South Wales), Ltd.; Guest, Keen Baldwins Iron & Steel Co, Ltd.; Hadfields, Ltd.; Hadfields Steels, Ltd.; The Hallamshire Steel and File Co., Ltd.; The Hodbarrow Mining Co., Ltd.; Irchester Ironstone Co., Ltd.; James Pain, Ltd.; J. J. Habershon & Sons, Ltd.; John Bagnall and Sons, Ltd.; John Baker & Bessemer, Ltd.; John Lysaght's Scunthorpe Works, Ltd.; John Summers & Sons, Ltd.; The Kettering Iron and Coal Co., Ltd.; The Lanarkshire Steel Co., Ltd.; The Lancashire Steel Corporation, Ltd.; The Lilleshall Iron & Steel Co., Ltd.; The Llanelly Steel Co. (1907), Ltd.; The Loddington Ironstone Co., Ltd.; London Works (Barlows), Ltd.; The Millom & Askam Hematite Iron Co., Ltd.; Monks, Hall & Co., Ltd.; Naylor Benzon Mining Co., Ltd.; The Neath Steel Sheet and Galvanizing Co., Ltd.; The New Cransley Iron and Steel Co., Ltd.; The Oxfordshire Ironstone Co., Ltd.; The Park Gate Iron and Steel Co., Ltd.; Partridge Jones & John Paton, Ltd.; The Patent Shaft and Axletree Co., Ltd.; Pease & Partners Lingdale Ironstone Mines, Ltd.; Pease & Partners Normanby Iron Works, Ltd.; Raine & Co., Ltd.; The Renishaw Iron Co., Ltd.; Richard Hill, Ltd.; Richard Thomas & Baldwins, Ltd.; Round Oak Steel Works, Ltd.; Samuel Fox and Co., Ltd.; The Santon Mining Co., Ltd.; The Sheepbridge Co., Ltd.; The Sheffield Forge and Rolling Mills Co., Ltd.; Shelton Iron, Steel & Coal Co., Ltd.; The Skinningrove Iron Co, Ltd.; Smith & McLean, Ltd.; South Durham Steel and Iron Co., Ltd.; The Stanton Ironworks Co., Ltd.; The Staveley Iron and Chemical Co., Ltd.; The Steel Company of Scotland, Ltd.; The Steel Company of Wales, Ltd; The Steel Company of Wales (Lysaght Works), Ltd.; Stewarts & Lloyds, Ltd.; Taylor Bros. and Co., Ltd.; The Templeborough Rolling Mills, Ltd.; Thos. Firth & John Brown, Ltd.; The Ullcoats Mining Co., Ltd.; The United Steel Companies, Ltd.; The Upper Forest and Worcester Steel and Tin Plate Works, Ltd.; The Wellingboro' Iron Co., Ltd.; The Whitehead Iron and Steel Co., Ltd.; The Whitehead Thomas Bar and Strip Co, Ltd.; William Beardmore & Co., Ltd.; Wolverhampton Corrugated Iron Co., Ltd.; The Wolverhampton Steel and Iron Company (1946), Ltd.; W. Wesson & Co., Ltd.

This week's conference of the Conservative Party at Blackpool passed a resolution "strongly condemning the Government's decision to nationalise the iron and steel industry, thus dislocating a vital industry and dividing the country in bitter party controversy at a time when national unity is imperative."

September Output was Another Steel Record

STEEL production in September reached the best annual rate ever recorded for that month, exceeding the 1949 September rate by over one million tons. The rate of 16.964 million tons achieved has been exceeded only once before—in March this year when the output was at a rate of 17.147 million tons a year.

The total steel output of 12.117 million tons for the first nine months of this year was also a record, being 530,000 tons more than the same period of 1949. The latter also was the highest production figure recorded. The increase so far this year is well ahead of the Government's "target" for the industry.

Pig-iron production in September was at the annual rate of 9.712 million tons compared with 9.634 million tons in the same month of last year. Details were:

Steel Ingots and Castings (thousand tons)

	1950		1949	
	Weekly average	Annual rate	Weekly average	Annual rate
First half-year	319.6	16.619	305.7	15,897
July ...	276.3	14,367	244.2	12,697
August ...	279.4	14,530	287.6	14,953
September ...	326.2	16,964	305.9	15,906
		Pig Iron		
First half-year	184.8	9,611	181.6	9,442
July ...	175.0	9,099	177.4	9,224
August ...	177.0	9,205	182.3	9,477
September ...	186.8	9,712	185.3	9,634

Rising Consumption Levels

Basic Production also Increased in July

INCREASED consumption of basic chemicals was noted in most items in July compared with the same month of 1949. The principal exception was the compound fertilisers group. Production was also generally higher, examples being (in thousands of tons): sulphuric acid 148.1 (132.8); superphosphate 16.5 (14.6); and compound fertilisers 118.1 (113.9). Stocks were on the whole slightly reduced, though there were increases in pyrites 74.1 (69.7); and spent oxide 187.1 (171.0).

Non-ferrous metals were again marked by an increase in production of lead (in thousands of tons) 5.48 as against 1.62 in July last year. Although consumption was higher, stocks of this metal rose from 54.7 in 1949 to 74.0 this year. Stocks of copper and zinc were further reduced.

There was a small rise in the estimated numbers employed in chemicals and allied trades the total for July this year being (in thousands) 446.6 as against 435.1 in the same month of 1949. Main increases were in the coke ovens, chemicals and dyes, explosives, etc., and oils, greases, glues, etc. Distribution of workers according to the *Monthly Digest of Statistics*, No. 57, was: coke ovens, chemicals and dyes, explosives, etc., 257.7 (190.3 men, 67.4 women); paint and varnish 38.8 (27.6 men, 11.2 women); oils, greases, glues, etc., 66.9 (54.1 men, 12.8 women); pharmaceuticals, toilet preparations, etc., 83.2 (43.2 men, 40.0 women).

	July, 1950 Thousand Tons			July, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	148.1	158.0*	—	132.8	132.0*	—
Sulphur	—	31.9	82.4	—	26.1	95.4
Pyrites	-	15.5	74.1	—	16.0	69.7
Spent oxide	—	15.3	187.1	-	15.5	171.0
Molasses (cane and beat)	10.7	50.7†	185.7	9.8	33.2†	260.2
Industrial alcohol (mil. bulk gal)	3.35	3.18	0.73	2.28	2.50	4.4
Ammonia	--	6.92‡	10.67	--	6.53	6.15
Superphosphate	16.5	12.4	- -	14.6	10.6	
Compound fertilisers	118 1	93.2	-	113.9	127.9	
Liming materials		419.8	--	—	377 1	
Nitrogen content of nitrogenous fertilisers	21.81	26.59	—	21.39	17 42	
Phosphate rock	—	79.5	331.5		73 8	219.5
Virgin aluminium	2.24	13 5	-	2.52	11 2	-
Virgin copper	—	28.1	126.9		25 2	142.1
Virgin zinc	5.41	19 1	58.2	4.73	12.5	81.7
Refined lead	5.48	12.4	74.0	1.62	10.8	54.7
Tin	2.15*	5.08	-	2 78*	1.76	21.8
Zinc concentrates		11.9	68 0		10 8	40.8
Magnesium	0 49	0.45	-	0.42	0 38	-
Pig iron	175 0	124 0	551.0	177.0	113.0	436.0
Steel ingots and castings (including alloys)	276.0	-	1,152 0	244 0		1,238.0
Rubber: Reclaimed	0.47‡	0.48‡	2 49	0 32‡	0.34‡	2.94
Natural (including latex)	-	3.77‡	38.1		3.05‡	38.4
Synthetic	-	0.04‡	0.90		0 04‡	1.69

* June. † Distilling only. ‡ Average of five weeks

Philippine Fertiliser Plant

THE Westinghouse Electric group has been awarded a contract by the Philippine Government amounting to $4.6 million for the construction of a chemical fertiliser works and a hydro-electric power station. The fertiliser plant, which is to be located in Mindanao, is to have a capacity of 50,000 tons of ammonium sulphate per annum. The Westinghouse organisation has estimated that the plant will save the Philippines about U.S. $4 million per annum in foreign exchange in connection with fertilisers for the production of rice and sugar.

Rising World Tin Totals

THE total production of tin from the world's mines, excluding those of the U.S.S.R. in 1949—161,700 long tons—showed a 6 per cent increase over the previous year. Asiatic countries accounted for 60 per cent of this total, South America 22 per cent and Africa 15 per cent, the remaining 3 per cent being produced by miscellaneous other sources. World smelter production of tin, at 168,700 long tons, increased by 7 per cent, the principal producers being Malaya (62,637 tons), U.S.A. (35,834 tons), the U.K. (28,384 tons) and the Netherlands (19,487 tons).

STAINLESS STEEL COSTS

Economies from the Sheffield Process

DEVELOPMENTS which may reduce the cost of stainless steel manufacture by as much as £2 per ton have been pioneered by a Sheffield firm with the help of the British Iron and Steel Research Association. By the substitution of a single addition of the alloy ferro-silicon-chrome for separate additions of ferro silicon and low carbon ferro-chrome during the later stages of the manufacturing process, substantial economies are effected in the use of expensive imported alloys. At the same time the valuable chromium content of the scrap stainless steel used as a raw material is more fully recovered, to the extent of between 91 and 93 per cent against 88 per cent before.

By using ferro-silicon-chrome the steel-maker performs two operations at once. The silicon in the alloy reduces the chromium which has passed from the scrap to the slag on the metal, while the chromium in the alloy also passes into the metal and compensates for the proportion that cannot be reduced. Previously ferro-silicon and expensive low carbon ferro-chrome (mainly imported from Canada and Scandinavia) had to be added in separate stages of the process. As ferro-silicon-chrome is an intermediate stage in the manufacture of ferro-chrome its price is considerably less.

The development, pioneered in Sheffield, of the oxygen lance method of making stainless steel in electric furnaces has made these further economies possible. Only during the last three years has it become possible to use stainless steel scrap as the main raw material in stainless steel manufacture. Some 30,000 to 40.000 tons of such scrap arises in Sheffield alone in a normal year. The high temperatures that oxygen " lancing " generates in the furnaces, up to 2000° C. against the 1650° C. previously, permits its profitable re-use.

NEW ENGINEERING CENTRE

London H.Q. for Exports

A CENTRAL home in London for the combined engineering associations, similar to the successful engineering Centre, Glasgow, has been in prospect for some time.

Early this year the Scottish Centre was asked by the British Engineers' Association to consider the formation of a headquarters to provide it with office accommodation, meeting halls, committee rooms and the facilities necessary for the effective working of the association and its allied organisations in the South. About 20,000 sq. ft. of display space is thought to be required for permanent exhibits, and for facilities for visiting engineers.

The project, outlined in the current issue of the " Engineering Centre Quarterly Bulletin," aims at providing for engineering trade associations, firms and visitors a focal point at which the primary considerations would be to serve the export markets of the world. Several buildings are now being considered. It is indicated, however, that much will depend upon close study of the possibilities of inflation and the effects of the re-armament programme on the engineering industry.

Reports on the Canadian International Trade Fair, Toronto, have also been received by the Engineering Centre, Glasgow, which undertook the organisation and management of a joint display of Scottish engineering products.

The most difficult problem in the Canadian market which this reveals, is that of obtaining entirely suitable agents. The expansion of British trade is straining the capacity of the firms who have good technicians, and until this is solved by emigration from U.K., the answer seems to lie in either group technical representatives assisting present agents or the formation of group selling companies staffed at the top from this country.

Continuous Steel Casting in U.S.A.

AN outstanding departure from ordinary technique in steel casting in the U.S.A. may follow the formation of Continuous Metalcast Corporation, in which Allegheny Ludlum and other large steel companies are participating to employ Mr. Irving Rossi's patented process for continuous metal casting. Information supplied to New York Stock Exchange, indicates that the process has been used commercially to produce brass and, to a limited extent, some types of copper. Allegheny Ludlum and others concerned—including the American Metal Company and Scovill Manufacturing—will develop the steel casting possibilities in U.S.A. and Canada.

German Steel Plant for Egypt

A delegation, headed by Maher Bey. Under-Secretary of the Egyptian Board of Trade is now placing contracts in Germany for the construction of a steel plant in Egypt.

WELDED PRESSURE VESSELS

Code Presented in London

THE usefulness of the work of specialist panels which has produced a provisional British Standard Code (No. 1500: 1949) for fusion-welded pressure vessels and the need for similar standardisation in kindred departments were made apparent at the meeting in London on Tuesday, called by the Institution of Chemical Engineers, at which the code was explained and discussed. The chairman, Mr. J. R. Reavell, said that the code owed its origin to a proposal by the British Chemical Plant Manufacturers' Association to the British Standards Institution in 1939. Its recommendations had now been applied for a year by chemical engineers.

Among the points raised in the course of full discussion at this week's meeting was the recommendation by Mr. J. W. Strawson (Shell Refining and Marketing Co., Ltd.) that any designs resulting from the code should be as economical as present knowledge and the price of materials permitted. The code closely resembled in some respects the existing standards for U.K. and U.S. petroleum equipment. A recommendation, by Mr. F. Peel (W. J. Fraser & Co., Ltd.), proposed the creation of a separate code which would include heat transfer formulae for the working chemical engineer and corrosion data relating to constructional materials.

Mr. Reavell expressed the thanks due to I.C.I., Ltd., whose chemical and mechanical engineers carried out much of the experimental work on which the current proposals are based. Copies of the finalised code were not available at the meeting, the printers' dispute having postponed their production.

New Laboratory Training Syllabus

THE curriculum for the new Intermediate Examination of laboratory technicians by the City and Guilds of London Institute, which has replaced the Institute of Physics Certificate (THE CHEMICAL AGE, 63, 220) is now in operation (1950-51 session).

The new scheme of study is divided into three sections: (1) Science and drawing; (2) General laboratory techniques and organisation, including workshop practice; (3) Specialised laboratory techniques. In sections 1 and 2 the syllabuses are common for all candidates but from section 3 a choice of one from ten specialised techniques is allowed. This selected group is intended to be introduced gradually in the second year of study, together with the relevant auxiliary science and drawing.

REVISED BRITISH STANDARDS

Industrial and Test Equipment

THE new issue of the British Standard for steel balls for Brinell hardness testing (B.S. 240, Pt. 2: 1950) is a revision of the standard published in November, 1929. That specified the hardness of balls used in carrying out Brinell tests, and having diameters of 10, 5, 2 and 1 mm. It required that the standard method of determining this hardness shall be by a diamond pyramid hardness test, but specified a reciprocal pressure test for use where a diamond hardness testing machine is not available. It set out the hardness numbers determined by this alternative method.

The revision largely affects the hardness numbers set out in the tables dealing with the two different methods specified. The new numbers have been calculated from a more accurate formula and a number of errors and inconsistencies discovered in the original have been corrected.

Copies of the revised publication may be obtained from the British Standards Institution.

Perforated Plate

Also published by the Institution is the British Standard for Industrial Perforated Plates (B.S. 1669: 1950). This replaces part of B.S.481 (woven wire and perforated plate sieves and screens for industrial purposes) which was issued in 1933. The new standard results for the formation in 1947 of a specialist committee, which at once recognised that the actual size of any screened material is a function of many factors besides size of apertures in the screens used for its commercial production, and that there need be no close adherence to the ranges covered by test sieves which are used solely to determine the exact size or size distribution of materials.

B.S. 1669 has been designed to cover industrial perforated plate having round and square apertures with the sizes and arrangements which are most commonly used, and tolerances on aperture size and pitch of apertures have been introduced.

No attempt has been made to standardise other shapes of aperture such as slots, but the bulk of industrial requirements is covered.

The standard, in addition, contains three tables giving aperture sizes and three pitch arrangements for industrial perforated plate with apertures from ⅛ in. to 3 in.

GOOD REPORTS OF U.S. ACID PROCESS

Simplified Principles of New Contact Plant

PROMISING reports have been made on the unconventional contact sulphuric acid process recently applied on a full-scale operational scale at the Hamilton, Ohio, plant of the American Cyanamid Co.

Preliminary reports (THE CHEMICAL AGE, *63*, 887), suggested that, by the elimination of seven major items of equipment, the new process developed by the Chemical Construction Corporation was more economical and much simpler than the conventional contact process.

Further particulars of the new method, which differs in nearly every major step from other contact plants, were given in *The Chemical Engineering News* (*57*, 181). This indicates that sulphur melting, filtering and burning are conventional, as well as the partial cooling of the SO_2 in a waste heat boiler, but there is no drying of the combustion air and the burner is operated at nearly 50 per cent higher SO_2 content of the output gas than is normal.

Conversion of SO_2 to SO_3 takes place in a new "quench type" converter which lacks the usual heat exchangers. It accomplishes conversion by means of a vanadium catalyst in four stages, with cooling between stages by the direct injection of air into the gas stream.

From the converter the SO_3 gas mixture passes through a two-stage absorber similar in appearance to a Chemico drum type concentrator. In the first or high strength stage the gas bubbles under the surface of acid from a dip tube. In the second stage it passes through a weak acid spray.

The absorber also acts as a cooler and eliminates the large amount of cooling surface and the large quantity of cooling water ordinarily needed in a contact plant. Only a small amount of cooling water is needed for the product acid which leaves the first absorber stage, and this water is later used for absorber acid makeup.

In the last step the large amount of acid mist created in the absorber is knocked out of the exit gases with a Pease-Anthony venturi scrubber. The gases, steam and mist pass through the throat of a venturi into which weak recirculated acid is injected. The venturi discharges into a small cyclone which catches and returns the liquid to the recirculating tank, venting steam, excess air, nitrogen and a trace of SO_2 to the atmosphere.

Rated at 50 tons per day on a 100 per cent H_2SO_4 basis, the unit has easily reached 120 per cent capacity. Currently the plant is producing 60° Be. acid directly—unusual in a contact plant, but it can readily be switched to produce any strength from 60° Be. to 93-95 per cent by a simple operating adjustment.

Oleum could be produced by adding oleum towers ahead of the absorbers, but some of the advantages of the new process would be lost in so doing and it seems probable that the main field for the process will be for 95 per cent or weaker acid.

Energy From Underground

THE first successful use, to operate a turbine, of gases generated by underground combustion has been made at the U.S. Bureau of Mines gasification project at Gorgas, Alabama.

Dr. W. C. Schroeder, chief of the Bureau's Office of Synthetic Liquid Fuels, says the 500-h.p. gas turbine, which pumps air to the burning seam 150 ft. below, was run on the exhaust gases from the burning coal. The hot gases enter the turbine at 1200° Fahrenheit, expand and cause the turbine to spin at 20,000 r.p.m.

This development is distinct from the principal objective, the production underground of synthetic gas for direct combustion and possible conversion into liquid fuel.

Atomic Network in the North

ABOUT 25,000 people will be employed in a network of atomic research and production centres to be built up in the North of England. Risley, near Warrington, is to become the key point of an atomic development scheme which will be outlined in a broadcast by a director of atomic research shortly. Risley will be the control centre for the extraction of uranium from ore at Springfield, the production of plutonium and radioactive gases from two atom piles at Sellafield, Cumberland, and the extraction of uranium 235 from uranium 238 at Capenhurst, Cheshire. Harwell is to be engaged wholly on research. More qualified staff are to be recruited from Manchester and Birmingham universities.

The Cobaltic Ion

Reactions in Various Solutions

A DISCUSSION of the reactions of the cobaltic ion was part of the programme at a meeting of the Chemical Society held at Burlington House on October 12. A paper " Reactions of the Cobaltic Ion with Water," read by C. E. H. Bann and A. G. White, began with a survey of simple cobaltic salt solutions.

It is well known that aqueous solutions of simple cobaltic salts rapidly decompose, the cobalt reverting to the cobaltous state and oxygen being evolved. A study of the kinetics of this rection by volumetric methods and by measurement of the rate of oxygen formation indicated that the reaction depends in a complex manner on the hydrogen ion concentration.

The variation of rate with Co^{+++} concentration showed that two simultaneous reactions occurred, one second order with respect to the cobaltic ion and the other first order, the latter being predominant at low ion concentrations. From an analysis of the results it is concluded that the rate determining step is the electron transfer reaction:

$$Co^{+++} + OH^{-} \longrightarrow Co^{++} + OH$$

but the simplicity of this process is obscured by hydrolysis and the complex formation involving the cobaltic ion.

The second and third parts of the paper dealt with the reactions of the colbaltic ion with acids, aldehydes and alcohols. Swann and Xanthakos (*J. Amer. Chem. Soc.*, 1931, *53*, 400) observed that concentrated solution of cobaltic sulphate oxidised a wide variety of organic compounds, and these observations have been confirmed and extended. Kinetic measurements have been made of the oxidation of a few representative organic compounds in acid media and under conditions in which the above reaction with water was negligible. The oxidation of formic acid in 2-8 N H_2SO_4 occurs according to the stoichiometric equation:

$$2CO^{+++} + HCOOH \rightarrow Co_2 + 2Co^{++} + 2H^{+}$$

and the rate determining process has been shown to be the electron transfer reactions:

$$Co^{+++} + HCOOH \rightarrow Co^{++} + HCOO\cdot + H^{+}$$
$$Co^{+++} + HCOO^{-} \rightarrow Co^{++} + HCOO\cdot$$

Rate measurements have also been made with formaldehyde, methyl, ethyl and n-propyl alcohols and various mechanisms of the reactions are discussed.

In general, the facts would appear to be consistent with an initial reaction of the transfer of an electron from the Co^{+++} ion to the organic compound with the generation of a free radical. The radical thus formed undergoes subsequent reaction with the solvent, initial reactant, cobaltic ion and other radicals formed in secondary processes.

Other papers read at the meeting included " The Kinetics of Organic Compounds" by J. Shorter and C. N. Hinshelwood and " Some Oxidation Reduction Reactions of Hydroxylamine," by P. Davis, M. G. Evans and W. C. Higginson.

Germanium as a Semi-Conductor

EXPLANATION of some of the unique electrical properties of germanium was offered at Schenectady, this week, by Mr. R. N. Hall, of the (U.S.) General Electric Research Laboratory. Describing " Properties of Pure Germanium ' before the National Academy of Sciences (October 10-12), Mr. Hall observed that the tetravalent element, immediately below silicon in the Periodic table—to which it is physically and chemically very similar—is a semi-conductor in the sense that only a very small fraction of the electrons present can contribute to the flow of electricity. Free electrons may exist as the result of thermal agitation or because donor impurities have added extra electrons or acceptor impurities have removed bound electrons. In the latter event, the vacant electron site is free to move and acts as a mobile positive charge, giving rise to what is called hole conduction. Germanium occupies an unusual place among semiconductors because the mobility of these free sites and electrons is greater than that observed in other semiconductors.

In the absence of impurities, germanium has a resistivity of about 75 ohm cm. at 20° C. as the result of a few parts per billion of thermally excited holes and electrons. Donor and acceptor impurities fused to geraminium act as sources of electrons and holes. Current flow between such contacts involves recombination and space-charge phenomena similar to those involved in gas discharges.

THE ESTIMATION OF FLUORINE

Micro-Methods Described at Birmingham University

METHODS for the estimation of small amounts of fluorine were described at a meeting of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists which was held jointly with the Birmingham and Midlands Section of the Royal Institute of Chemistry, on Wednesday, September 27. The meeting, which was held in the Mason Theatre of Birmingham University, under the chairmanship of Mr. R. Belcher, took the form of a symposium having the general title of "Micro-Analytical Chemistry of Fluorine."

The first paper, by Mr. F. P. Johnson, dealt with the Analysis of Organic Fluoro-compounds. The presence of fluorine in organic compounds affects the results obtained when determining other elements, as well as presenting the microanalyst with the direct problem of the determination of fluorine itself. In consequence, some modification of the normal methods for carbon and hydrogen is necessary if the percentage of fluorine present is higher than 25-30 per cent. With a modified tube packing there is some attack of the combustion tube, but no serious difficulty arises unless a large number of fluorine compounds is being analysed. Compounds with a high fluorine content, *e.g.*, 75 per cent, are, however, extremely stable, and the combustion must be carried out at a minimum temperature of 750° C. The silica combustion tube is appreciably attacked, and a considerable amount of silicon tetrafluoride is formed. Once this happens subsequent combustions, even of non-fluorinated compounds, are affected.

Lead chromate was used to absorb the silicon tetrafluoride. This part of the packing, which fuses below 750° C., must be kept just within the furnace where the temperature is about 600° C. Such a tube has a life of about 30 to 40 combustions, but must be discarded as soon as either the tube or the packing begins to evolve silicon tetrafluoride.

Methods of Weighing

Liquids and volatile solids are weighed in capillary tubes, while substances which are gaseous at ordinary temperatures may be weighed in capillaries by cooling in solid carbon dioxide. Non-liquefiable gases are introduced by means of a gas burette.

Highly fluorinated compounds, in which the hydrogen content is consequently very low, are difficult to analyse by the ordinary method. For such substances the method of combustion at 1200° C. in a platinum tube gives satisfactory values over the range 0-1 per cent hydrogen.

A normal Dumas combustion is satisfactory for nitrogen. The molecular weight of volatile substances is determined by the well-known method of Bratton and Lochte. A Rast method for less volatile substances has proved very successful. This method utilises difluorotetrachloroethane as solvent, a substance which has a very favourable value for K.

Apart from the increased difficulty in decomposing the sample, which is achieved by potassium fusion, the determination of halogens other than fluorine presents little difficulty. Fluorine itself is determined by a potassium fusion, subsequently titrating the resulting potassium fluoride with thorium nitrate, using alizarin-S indicator. The fusion is carried out at 350-400° C. in an evacuated sealed glass tube. One aliquot portion of the final solution may be used for fluorine determination, the other halogens being determined in further aliquot portions.

Precise Titration

The thorium titration must be carefully controlled. The relationship on which it is based is non-stoichiometric, and the end point is empirical and subjective. It is doubtful if this particular titration method for fluorine, one on which much work has been published, can be further improved, and any increase in the precision of determining fluorine will probably result from the development of a radically different method.

Dr. W. T. Chambers, whose paper was entitled "The Microdetermination of Carbon and Hydrogen in Fluoro-compounds," explained that two problems arise in the combustion process: (1) the necessity for ensuring complete oxidation of the compound, a difficult process because of the remarkably high stability of the C-F linkage, and even more so of the CF_3 group: and (2) the production of silicon tetrafluoride. The methods devised to overcome the latter difficulty in particular, differed from that described in the previous paper.

Using a conventional tube filling of silver-copper oxide-silver, at 650-700° C., a compound such as benzotrifluoride gave a result for carbon which was low by an

amount almost exactly corresponding to one carbon atom, while subsequent combustions in the same tube were unreliable. Addition of lead dioxide at 190° C., at the end of the filling, improved the results, although the carbon value was still low. When the combustion temperature was increased to 800° C. even the most highly fluorinated compounds such as fully fluorinated dimethyl*cyclo*hexane gave satisfactory carbon figures.

The use of lead dioxide raised a further problem, due to the necessity for maintaining a proper lead dioxide-water equilibrium when dealing with compounds containing little or no hydrogen. Two methods could be employed to cope with this. The tube could be pregassed to reduce the water content of the dioxide, and then two preliminary combustions of carbon tetrafluoride carried out. Alternatively, the water content of the dioxide is not disturbed, but a known weight, several milligrams, of water might be vaporised with the sample, the hydrogen content as determined then being corrected for the added water. This investigation has enabled valuable use to be made of the hitherto objectionable properties of lead dioxide.

Precipitation as Lead Chlorofluoride

Dr. F. R. Cropper described a "Potentiometric Titration of Fluoride with Lead." Agreeing with Mr. Johnson about the thorium titration of fluoride, Dr. Cropper said that it had been decided to investigate a completely different method, *e.g.*, the precipitation of fluoride with lead as lead chlorofluoride. The methods hitherto published have involved precipitation, filtration, washing of the precipitate with saturated lead chlorofluoride solution, and re-dissolution of the precipitate, the final determination of chloride being carried out by Volhard's method. Considerable correction is necessary, and probably adsorption of chloride ion on the precipitate is a serious cause of the inaccuracy reported by many workers.

Farkas and Uri have described a potentiometric determination of lead involving titration with sodium fluoride, with a claimed accuracy of 0.5 per cent. It was decided to investigate the possibilities of using the reverse process. The principle of the method is to add a considerable excess of chloride to the fluoride solution, titrating with lead nitrate solution in the presence of an indicator comprising a large amount of ferric chloride and a small amount of ferrous chloride. The ferric chloride is complexed reversibly by the fluoride ion, forming FeF_6^{---} Towards the end point this ferrifluoride ion dissociates, liberating $Fe^{+++}$and changing the redox potential markedly.

Up to the present the method has only been applied to the titration of sodium fluoride solutions, and its application to the decomposition products of organic fluorine compounds has not been studied. Suitable conditions for the semimicro determination, involving 40-120 mg. fluorine, which give reproducible and accurate results, have been evolved. For micro quantities, where the fluorine content is 4-16 mg., similar experiments have given moderately good results, but there is still room for considerable improvement on this scale.

Mr. R. F. Milton described a "Multiple Apparatus for the Determination of Micro Quantities of Fluorine." This distillation apparatus, which was on display, was devised for the estimation of fluorine in biological substances and foodstuffs. In such cases, in contrast to the determinations previously described, the amounts of fluorine involved are very small—down to one or two micrograms, while the accuracy required at this range is of the order of 10 per cent. Consequently the main difficulty which arises is in reducing the fluorine blank of the reagents and, in particular, the apparatus used.

The usual procedure is to destroy the sample by lime fusion in platinum, and then to separate the fluorine by distillation in glass. Glass always gives a fluorine blank of the order of micrograms in the conventional estimation, and the problem of how this may be eliminated has been achieved by reduction of the glass surface. At the same time spray is trapped efficiently. Instead of the normal 150 ml. flask, a flask of 25-30 ml. capacity is used, and with the multiple equipment shown, four distillations can be carried out simultaneously, the distillation time being 10-12 minutes.

In the subsequent titration of the fluoride with thorium nitrate, solachrome blue is preferred as an indicator to alizarin-S, and the results on qualities of 5 to 0.5 mg. fluorine had the desired accuracy of 10 per cent.

U.K. Aluminium Price Raised

The selling price of virgin aluminium (99.0 to 99.5 per cent) in ingot form was increased on October 9 by £8 to £120 per long ton, delivered. This is the first alteration in the U.K. price of the metal since September, 1949, when it was raised from £93 to £112 a ton as a result of devaluation. The existing addition of £2 10s. a ton for metal in notch bar form remains unaltered and there is no change in the premiums for higher purities.

SEPARATION OF INTRACTABLE MATERIALS

*Uses of a New Ion-Exchange Resin**

THE development of the antibiotics industry during the present decade has made the need for better chemical adsorbents increasingly apparent. These powerful new pharmaceutical materials—penicillin, streptomycin, bacitracin, etc., are commonly made by fermentation processes which involve the use of large volumes of nutrient solution. When an antibiotic is formed in the fermentation vats, it represents only a minute fraction of the tremendous mass of material present.

Furthermore, the extraneous material frequently resembles the active ingredient itself. Until recently there has been no really efficient means of extracting the tiny fraction of useful drug from the great mass of other material.

Now, however, a synthetic resin introduced by Rohm & Haas two years ago has proved valuable in many types of chemical recovery problems and is particularly useful in the isolation of several of the antibiotics.

Chemically, the new adsorbent is a carboxylic-acid, cation-type, ion exchange resin. (Amberlite IRC-50) in the form of tiny, hard, spherical beads.

Ease of Recovery

It derives much of its power of selective adsorption from the fact that it can be treated to perform its adsorptive function at specific *p*H values. Besides this the resin offers the additional advantage of ease of recovery of the adsorbed material. This is in contrast with some of the earlier forms of ion exchange resins which sometimes held adsorbed material so tenaciously that removal on a commercially practical basis was impossible.

In the antibiotic field, Amberlite IRC-50 is stated to be an effective device for the recovery of those products which react as bases and it is employed commercially for this purpose. After adsorption, the recovered chemical is easily flushed free from the resin and the exchanger is ready for regeneration and re-use.

Such a resin obviously has many possible uses. There are numerous operations, both in the preparation of pharmaceuticals and in the manufacture of other types of products, where selective adsorption is a processing requirement.

* Abstract of an article in the *Rohm & Haas Reporter*, 8, 2, 20-22.

The isolation of alkaloids is typical. Quinine, for example, is prepared by a series of extraction and crystallisation operations which are costly, complex and time-consuming. The natural chincona bark from which the quinine is obtained also contains undesirable alkaloids. The quinine must be separated from these before it can be used in medicine.

The problem is complicated by the fact that the origin of the bark is in the tropics and, for practical reasons, the isolation work should be performed there. A simplified means of effecting the separation at the place where the bark is collected would be a noteworthy contribution to the quinine producing industry.

Quinine Separation

Amberlite IRC-50 offers a means of accomplishing such a separation of the quinine from the other extraction products. It has been suggested that portable exchange units could be set up and used where needed. Extremely simple equipment of this type could open the way for the production of quinine of remarkable purity at a considerable reduction of cost. A similar process could be developed for the recovery of other alkaloids—nicotine, cocaine, morphine and related compounds of this type.

Another interesting application for the new resin is in the separation of the basic amino acids—arginine, histidine and lysine from the neutral and acid members of the amino acid group.

The amino acids are in increasing demand both for dietary and therapeutic uses; but isolation and purification of the individual compounds have long been troublesome. An ion-exchange technique using Amberlite IRC-50 is now in pilot plant operation and may solve the problem.

Since the advent of Amberlite IRC-50 as applied to water treatment, this resin has proved more efficient and more economical in certain cases than any of the other types of resins. Amberlite IRC-50 efficiently reduces the alkalinity and solids content of hard, highly alkaline water. The activity of the resin stems from weakly acidic carboxylic groups which can be regenerated with small quantities of inexpensive acids—an economical advantage that is not shared by the strongly acidic exchangers.

DEVELOPING THE PAPER SACK

Fruits of Five Years' Study by the Fertiliser Industry

by A. T. BROOK, D.I.C., M.Sc., A.M.I.Mech.E.

WET strength and union papers, when tested by the normal tensile test or burst test methods show up equally as well as plain Kraft in relation to their DC weight (weight in lb. of 2000 sq. ft.; Kraft for 1 cwt. fertiliser sacks is 37 DC).

So recent is the acceptance by agricultural fertiliser industries of the 1 cwt. multi-wall paper sack, in which today some 90 per cent of granulated fertilisers are contained, that the field for innovation and improvement in the materials forming the plies, seams, closures and filling methods is still very wide. Far ranging practical research in conventional and unconventional materials and methods, upon which such advances will largely depend, has been carried out since 1945 by Fisons, Ltd., with collaboration from Medway Paper Sacks, Ltd. The fruits of that work have now been fully disclosed in a paper read before the Fertiliser Society by A. T. Brook, whose intimate concern with such investigations since 1944 enables him to indicate some possibilities of securing greater serviceability by adopting modified constructional materials and methods.

When, however, they are subjected to shock loads, such as occur when a sack is dropped, they are relatively much weaker, and a search has been made for alternative materials which would act as waterproof and acidproof barriers and at the same time provide useful strength to the sack. The main materials tried out have been:—

Sisalkraft of various types; crepe paper; and plastic-coated paper.

Sisalkraft is made in various forms, one of which is a heavy union type employing wet-strength creped papers as the outer plies; sandwiched between them are layers of bitumen with an open-mesh sisal scrim which provides extra strength and limits the extent of stretch of the crepe.

This attracted us as a possibility for sack construction, and single-ply gusseted sacks of normal size, *i.e.*, 18 in. by 4 in. by 37 in. were made from it.

As far as the sack walls were concerned, the strength of such sacks proved at least equal to that of normal 5-ply sacks. The cost also appeared favourable, but our tests showed that further consideration would need to be given to the strength of the stitched and seams, as the sacks all failed by tearing between the stitching holes.

Sisalkraft produced a sack having the feel and performance more of a textile sack. Unfortunately, limitation of supply prevented further tests being conducted.

Crepe Kraft

It is well known that crepe paper has much greater resistance to shock loads and to accidental tearing than ordinary plain paper. The degree of creping can be controlled at will, according to the purpose for which the paper will be used.

The type used as an outer ply for paper sacks is a special low-stretch crepe (6 per cent extensibility) which is made in the course of the normal paper-making process.

Crepe papers having much greater extensibilities (up to 20 per cent) are made as a separate converting process from plain Kraft, and for many years before the war special sacks known as Crepesacs were widely used in this country by the milling trade. They proved much stronger than sacks of plain Kraft.

Drop Test Endurance

We have tried a number of 3 and 4 ply all-crepe sacks, in this case American made, and, although holding only about 105 lb. granular fertiliser, the comparison of drop-test figures with those of standard 5-ply 1 cwt. sacks is interesting.

The 3-ply sack, having an overall DC weight of approximately 164 lb., when subjected to test, withstood 172 drops before bursting, and the burst then was due entirely to chafing by the rope slings supporting the sack in the testing machine. The rest of the sack appeared perfectly sound, and the stitching at the maker's end, which was of 12's/4 cotton without filler cord, but with a crepe paper tape as in the Bates stitch, was entirely unaffected. Thus it was evident that the crepe paper itself reduced the load on the stitched ends, and I consider that there

* A short abstract of "Fertiliser Packaging: the Development of the Paper Sack," by A. T. Brook, D.I.C., M.Sc, A.M.I.Mech E., presented in London on October 12 before the Fertiliser Society, which has published the paper in full.

must be a considerable future for this type of sack when the difficulties of manufacture have been overcome.

One such difficulty would be the manufacture of a satisfactory creped union paper in which the bitumen layer was perfectly sound. Again, crepe paper handles and folds quite differently from plain paper, and existing sack-making machinery may not be able to deal with it. The crepe used in the sacks had a percentage stretch of approximately 12.

As an alternative, the author considers that sacks having an outer ply of wet-strength crepe paper in place of the existing plain paper, would be a big improvement. Such an outer ply would resist accidental damage, and if this ply remains sound during handling and transport the rest of the sack cannot suffer damage.

Plastic-Coated Papers

An alternative to the employment of creped papers would be some means of strengthening existing Kraft, and great headway has been made in recent years with the coating of paper with plastics. Various treatments have been applied using water dispersions of PVC, or PVC dissolved in organic solvents. It is understood that the performance of these papers has been rather disappointing, but meanwhile some success has been achieved both in the U.S.A. and more recently in this country in the coating of paper with polythene, which is melted on to the paper and regulated by doctor-knife treatment.

In this process, perfectly uniform polythene coatings down to .0005 in. thickness can be applied, and at the same time a useful addition to the strength of the paper is provided. Consideration of the specification of our present 5-ply sacks show that if the inner union were replaced with a coated paper, with the plastic on the inside, and a similar paper used for the outer ply, again with the plastic inside, there would be at least four paper plies fully protected both from inside and out, compared with the existing two protected plies. Such sacks should, therefore, be considerably stronger than sacks using union paper, and they would lend themselves to 4 or even 8-ply construction. The acid and water-proof qualities should be superior to sacks employing bitumen-union papers.

Reference to Table 1 shows that the permeability of polythene is a very small fraction of that of union paper. The thickness of the bitumen layer in an average union paper is .0015 in., so obviously polythene coatings of only .0005 in. thickness will have a much greater resistance to passage of water and acid vapour.

TABLE 1

Material (Uncreased)	Permeability (P) $\times 10^3$ at 20°C.
Standard Cellophane ...	50
Regenerated Cellulose	40—50
Plasticised Cellulose Acetate...	45
Bitumen Union Paper (weight not known) ...	13
Soft Vulcanised Rubber ...	5
Microscopic wax-coated Cellophane...	1 5— 4.5
Plasticised Polystyrene ...	3.5
Plasticised PVC ...	0.8
Rubber Hydrochloride (Pliofilm) ...	0.2
Polythene (2 thou. film @ 0°C) ...	0.15

Weather Resistance

The initial moisture content in every case was approximately 1 per cent and it is interesting to note that the fertiliser in the jute sacks indoors reached an equilibrium of 2 per cent, whereas that in the paper maintained its initial content of 1 per cent.

In the outdoor clamp the moisture content of material in the jute sacks presumably varied with the weather, but again the paper sacks maintained their initial figure.

Developments of this nature are entirely in the hands of the paper manufacturers, as the processes involved necessitate considerable expenditure in new plant and equipment.

Until recently the supply and price of polythene have been such that developments of this nature were limited, but its rapidly increasing use, with corresponding reduction in price, should make developments as just outlined more practicable.

Setting and Moisture Content

There are very wide divergencies of opinion regarding the setting behaviour of fertilisers when filled into paper sacks as compared with jute. The whole subject of setting is very involved and a large number of factors, apart from the nature of the package, can affect the problem.

Where we have wished to carry out setting tests employing paper sacks we have usually found it most difficult to make the fertiliser set at all, yet many customers have found after storing paper sacks containing fertiliser, that they can become solid slabs.

The amount of such set in paper sacks is deceptive, particularly to those more used to jute sacks. We have found that an apparently heavy set can readily be removed by dropping the sack flat, two or three times, from a height of 3 ft. This breaks up the main set, and remaining lumps can be dealt with by judicious use of a wooden mell. If the paper is not too dry and the sack not too tightly filled,

(continued at foot of next page)

Estimating Fertiliser Values

Analytical Chemists Propose New Methods

THREE suggested techniques for establishing some essential values in fertiliser materials, each appearing to offer considerable advantages over existing methods, were described at a meeting of the Society of Public Analysts and Other Analytical Chemists in London last week.

Experimental evidence was submitted to show that the value of a burnt lime for agricultural purposes may be seriously under-estimated by the method prescribed under the Fertilisers and Feeding Stuffs Act. This was offered in the course of a paper, "The Evaluation of Liming Materials for Agricultural Purposes," by A. M. Smith, Ph.D., D.Sc.; A.H.-W.C., F.R.I.C.; A. Comrie, B.Sc., A.R.I.C.; and K. Simpson, B.Sc., A.R.I.C.

Calcium silicates and magnesium oxide are able to neutralise soil acids, and the latter is also important as a source of magnesium in certain soils.

New Methods

Various methods of estimating the neutralising value have been examined and a simple technique, involving a short treatment with dilute acid and applicable to both carbonates and limes, has been found to give results in agreement with the effects produced on soil acidity in pot and field experiments.

N. H. Wilson, F.R.I.C., presenting a paper on "The Accurate Determination of Phosphoric Anhydride by means of Quinoline Phosphomolybdate," critically surveyed the present methods of determining phosphoric anhydride and outlined the requirements of a new method. Such a method should be at least as accurate as the "official" method and much quicker.

As the phosphomolybdate reaction appeared to be the most suitable, previous work on this subject was summarised, and the reaction discussed in detail.

It was shown that very accurate results could be obtained from the volumetric method by precipitating quinoline phosphomolybdate instead of the usual ammonium salt. Few substances present in fertilisers interfere except ammonium salts, which can be destroyed. A large excess of sulphuric acid also interferes.

Results by the "official" and the new method were compared and the respective standard deviations were 0.065 and 0.024 per cent of phosphoric anhydride. Full working details were given for the accurate determination of phosphoric anhydride in fertilisers.

In "The Determination of Potassium in Fertilisers by Flame Photometry," L. Brealey, B.Sc., showed that the potash content of fertilisers could be determined simply and quickly by flame photometric methods. Reproducibility was excellent and the results obtained agreed well with determinations by the official chemical method. Interference from the other constituents of fertilisers so far investigated was shown to be negligible. The instruments used were built in the laboratory and were of a very simple design.

The chief advantage of the method is its speed, which makes it particularly useful for production control.

DEVELOPING THE PAPER SACK

(*continued from previous page*)

it is surprising what a considerable amount of treatment of this nature a paper sack will stand. It may be useful to mention at this point that if sacks were constructed entirely of crepe paper, or even with an outer ply of this paper, they would be able to withstand such treatment more easily, to the benefit of the farmer.

Undoubtedly the most valuable feature of the standard 5-ply sack is its resistance to moisture, and this must contribute towards minimising the degree of set. We have measured changes in moisture content of fertiliser stored in outdoor clamps and in good sheds, using "B" twill jute sacks and fully waterproof paper sacks, and the following figures may be of interest.

	Moisture content of fertiliser		
	After 1 mth.	After 2 mths.	After 3 mths.
Type of Sack	%	%	%
'B' twill in clamp ...	2.15	3 05	2.5
Paper sack in clamp ...	0 94	0.98	0.95
'B' twill in shed ...	2.00	2.00	2.10
Paper sack in shed ...	1.08	0.95	1.04

Blind Chemists

Research chemistry is among the wide range of occupations taught at St. Dunstan's, of which the 85th annual report is now published. In "Pulling their Weight," the chairman, Sir Ian Fraser, M.P., describes the continued work of this great institution.

POLYAMIDE RESIN WATER DISPERSIONS

Widening the Sphere of Plastics Processes

From A SPECIAL CORRESPONDENT

ORDINARY nylon polymers used in textile and plastics applications present the difficulty of being unsuitable for making stable water dispersions. It is necessary to produce special polyamide resins for this and considerable success has been achieved by utilising resins prepared by the condensation of dimerised vegetable oil acids with ethylene diamine.

Suspensoids made from these resins are now in use in the U.S.A. General Mills, Inc., for example, is producing polyamide resins suspensoids that are white, opaque liquids of medium viscosity with solid contents of 35-42 per cent. They are slightly acidic but remarkably stable and can be subjected to repeated freezing and thawing without coagulation. Advantages offered by such suspensoids over the hot melt or solution type polyamide resins may be summarised thus:—

1. Water dispersions of the resin enable solutions to be prepared of higher solids content at low viscosities.
2. They are easier to apply than either solvent solutions or hot melt coatings.
3. Penetration can be more accurately controlled.
4. The elimination of expensive solvents promotes economies.
5. Fire and health hazards are reduced as the dispersions are non-inflammable and of low toxicity.
6. Dispersions can be produced in many different forms for specific applications.

By modifying the nature of the raw materials or the conditions of polymerisation, it is possible to produce many different types of base resins, permitting a wide range of dispersions to be made. The suspensoids can themselves be altered by the inclusion of certain modifying resins and by special compounding after dispersion. Some dispersions are stable at low temperatures and have exceptional adhesive or bonding characteristics. Others exhibit exceptional resistance to blocking and lend themselves readily to further compounding for the manufacture of adhesives.

The polyamide suspensoids as a class are easily applied to a variety of surfaces, such as paper, cloth, wood, metal foils, plastic films, etc., to produce white films composed of discrete particles, indistinguishable to the eye. These films dry rapidly and do not block even under severe humidities and pressures; moreover, the coatings age well and show no signs of deterioration after long exposure to air.

Commercial polyamide resin suspensoids can be diluted to any desired concentration with ordinary tap water, and organic solvents may be added to the dispersions to improve gloss and adhesion of the resin to plastic films or resin surfaces. It is possible to incorporate in the suspensoid relatively large quantities of solvent in which the polyamide resin is insoluble.

Plasticisers, such as dicapryl phthalate, dibutyl phthalate, dibenzyl sebacate, dioctyl sebacate, etc., can be incorporated in the suspensoid to increase flexibility, lower the softening and heat seal temperatures, to improve tack and gloss.

Increasing Compatability

Normally suspensoids are produced as cationic liquids and they are, therefore, only compatible with other cationic or neutral emulsions and dispersions, such as polyvinyl acetate emulsions and certain rubber latices. It is, however, possible to reverse the charge, and so obtain an anionic dispersion compatible with a wide variety of anionic emulsions, dispersions and latices.

Ease of modifying standard polyamide resin dispersions is one of the outstanding advantages of these preparations. Not only may solvents and plasticisers be added to modify properties, it is also possible to incorporate thickeners, stabilisers, pigments and dyes. Nitro-cellulose, hard waxes, paraffin wax and certain oils, such as castor oil, can be added to reduce tackiness.

The most important uses likely to be found for polyamide resin dispersions, when they become more generally available, are as adhesives and protective coatings. Cements and adhesives based on these dispersions are readily applied to paper, cloth, leather, cork, metal foils, regenerated cellulose film, wood, and certain plastics and plastics films. They have excellent heat seal properties in the lamination or bonding of papers, cloths and foils.

New Light on DDT

Retention in Animal and Human Systems

THE ingestion of some of the toxic material of DDT by men and animals has lead to considerable disquiet about the widespread use of this insecticide and, in the U.S.A., has given rise to official restrictions. These considerations will heighten the interest in current research in the Pest Infestation Laboratory (Department of Scientific and Industrial Research), of which some results have now been reported (*The Journal of the Science of Food and Agriculture*, 1, 7, 214-219). This work reflects, incidentally, the useful practical application of radioactive isotopes, in this instance the bromine analogue of DDT, Br^{82}, one bromine atom replacing the para-chlorine atom of DDT.

Residues Ingested

Whole wheat grain was sprayed with this DDT analogue and subsequently fed to hens or milled and baked into bread which was fed to rats; in one experiment the bread was consumed by one of the research workers. It was clearly shown that there is a substantial retention of insecticide residues by animal tissues and organs, and there was strong indication of chemical changes occurring in the insecticide molecule both as a result of baking the milled wheat and also in animal metabolism.

The whole grain carried a residue of 40.2 p.p.m. of the radio-labelled insecticide. After conversion into flour at an 85 per cent extraction rate the concentration was 14.6 p.p.m. and that of bread made from the flour was 11.2 p.p.m. Within a few days of feeding the grain to hens, the insecticide was found to be widely distributed in their bodies, particularly in the liver, gizzard, sciatic nerve fibre, and heart tissue. The retention appeared likely to have lasted for a considerable time. Somewhat similar results were secured, after five days, with rats.

In the single human test, in which 30 grams of bread containing 200 p.p.m. at a low stage of activity were eaten, 5 per cent of the total activity was expelled in urine in the first 48 hours. This would seem a disturbingly low figure, suggesting that the human body retains a very substantial proportion of DDT-type residues when these occur in or on food. In this connection, it was suspected that, in baking, some of the DDT analogue combined with the protein of the flour.

It may be objected that this work was carried out with an analogue of DDT and not with DDT itself. But it should be borne in mind that previous work has shown that the physical, chemical, and insecticidal properties of the Br-analogue are all closely similar to those of DDT. The halogen element in the para-position is believed to provide lipoid solubility rather than toxicity, so that the same toxic factor is present in the Br-analogue.

It is not easy to dispute the conclusion reached in this unique paper, that "every possible precaution should be taken to prevent contamination of foodstuffs with DDT until more is known of its chemistry in relation to food." The results amply support the general opinion that DDT cannot be used for the protection of stored grain.

Thiocarbamic Acid Derivatives as Fungicides

CONSIDERABLE development has recently taken place in the application of derivatives of thiocarbamic acid as fungicides. Much of the earlier research work was carried out in the U.S.A., but progressive investigations have more recently been made in Great Britain and the Netherlands.

Tests over a reasonably long period have shown that these derivatives are effective as dusting powder and, as liquid sprays, have good spreading, wetting and adhesive properties. In all these formulations use is made of a further principle, the synergistic action of certain tri-aryl phosphate series. The main esters used are tri-cresyl phosphate and triphenyl phosphate.

These relatively new agricultural chemicals, like most others, call for some precautions in their use, which are dealt with in a detailed short survey of the Vitospor-X series of fungicides (Vitax Technical Bulletin No. 10; Vitax Fertilisers, Ltd.).

Toxicity to men or animals, a factor of considerable importance in the relatively new formulations of this kind, is relatively low. Brief encounters with spray drift or dust are said to be harmless, although prolonged inhalation must be avoided.

The summary distinguishes as the most hazardous portion of the compound the tri-cresyl phosphate and quotes some reassuring evidence provided by the toxicology research unit of the Chemical Defence Experimental Establishment.

OVERSEAS CHEMISTRY AND INDUSTRY

FRENCH CHEMICAL EXPANSION PLANS

Costly Developments Recommended in Commission's Report

THE full report of the Commission de Modernisation des Industries Chimiques, dated October 1949, has only just been published, but the gist of the general conclusions had already been conveyed to some of the leaders in the industries concerned. It is a volume of 260 pages in which are condensed the findings of 300 experts, members of the various subcommittees. The editor is M. Moreau, who was assisted by M. Borocco.

It is concluded that the capital resources of private enterprise will be insufficient to finance all the developments recommended, which are estimated to cost at least Fr.175,000 million (1949 valuation), and special loans are recommended, from the Conseil National du Credit in particular.

The report comprises six main groups: General introduction dealing with fundamental questions such as research, professional training, raw materials, selling prices, finance, export trade, equipment; inorganic products—nitrogenous, fertilisers generally, sulphuric acid and products, alkalis, pigments; electrochemical and electrothermal products; organic: (*a*) general organic synthetics, (*b*) dyes, pharmaceuticals, plastics, synthetic rubber; semi-chemical products such as paints and varnishes, rubber, detergents, glass; miscellaneous, *e.g.*, carbon black, catalysts, insecticides, etc.

The following basic data and estimates for particular industries and branches are presented: Total requirements forecast for 1952 in respect of the French home market, French colonial market, and general exports; technical and economic aspects and factors; the relation of capacity to these estimated needs; raw materials, power supply, equipment, finance.

Comparison With FBI Report

The statistical information given varies from industry to industry, being much more abundant in some than in others. Commenting on this point, J. Raimbault compares this matter of statistical wealth and poverty with a similar report by the FBI in Great Britain, in which, for any of the 17 industries or groups dealt with, it was considered sufficient to indicate the actual tonnage and value of present output and of future objectives. The statistical data on which these are based, however, do not appear to have had the same detailed study as in the French report; at all events they have not been shown (*Chim. et Industrie* 1950, 64 (3) 361-3).

It would be easy to criticise the forecasts made for 1952, which the authors of the report are careful to point out are only approximate and dependent on uncertain factors. The attainment of the anticipated levels will largely depend on the energy, skill, and vision with which the various basic and general questions are tackled. The principal of these are described in the report.

The urgent need for the utmost development of technical research is axiomatic, and the report stresses that in the U.S.A., Great Britain and Germany research expenditure constitutes at least 3 per cent of the total turnover. The qualitative and quantitative study of staff and labour requirements corresponds to the estimated forecasts of increased production; that is to say, about 350,000 in 1952 and about 50,000 above the present number. Recommendations are made in respect to educational and training facilities to provide the increased numbers in the various categories, professional and otherwise.

Raw Materials

The raw materials side of the complex whole has been thoroughly examined with regard to power sources (coal, etc.) and numerous detailed recommendations are made and resolutions recorded for passing on to the public authorities concerned, both as to fuel sources and other raw materials, indigenous or colonial. It is expected that the modernisation plans should result in more efficient and economical production, due, among other things, to increasing unit capacity of plant; improved equipment; grouping of plants engaged in closely related products or derivatives; use of cheaper raw materials.

Dealing with the special needs of plant and equipment renewal, the report states that plant and apparatus were obviously in a bad way after the war, and owing to high taxation and other causes it has not been possible to build up a fund for obsolescence or otherwise. Even after some of the taxation—purchase tax, for example—has been reduced or removed, this financial inability still remains.

INDIA'S PAINT INDUSTRY

Production and Expansion

INDICATIVE of the recent considerable expansion of the Indian paint industry is the fact that there are now about 150 factories, mainly in Calcutta and Bombay, engaged in the production of paints, enamels and varnishes. Ten of these are leading firms and 40 are medium-class manufacturers, while the remainder are small units.

The 1938 output of standard paints, enamels and varnishes in India was 24,740 tons. Imports of finished paints in 1937-38 aggregated 6067 tons, and in addition, 10,000 tons of raw materials such as pigments, colours and mineral turpentine were also imported.

In 1949 the production of standard paints, enamels and varnishes had increased to 30,929 tons. Imports of finished paints fell to 1642 tons and raw material imports were 9669 tons.

The present installed capacity of the Indian paint industry, for standard paints and enamels, is estimated at 60,000 per year, and that for high grade paints and synthetic enamels is about 3 million gal. annually.

The Indian paint industry concentrates on the manufacture of distempers, stiff paints, ready-made paints, varnishes and bituminous compositions. The manufacture of special paints is still in its infancy.

In recent months attempts have been made to manufacture superior quality paints, synthetic enamels and varnishes. Synthetic resins and nitro-cellulose lacquers are now being produced, and the production of white barytes by the bleaching method is also being attempted.

The construction of a plant for the production of aluminium paste and powder has almost been completed. The production of titanium dioxide from ilmenite is expected from 1951. The capacity for producing zinc oxide has been increased from 5000 tons in 1945 to 7000 tons per year today. A lead oxide plant, suitable for battery manufacture, is also being set up.

Malayan Tin Exports Record

Exports of tin from Malaya in September established a new record for 1950 with a total of 8597 tons, an increase of 1097 tons above the previous month. Main recipients were: U.S.A. 2170 tons; and the U.K. 1778 tons. The balance was shared between Europe 3147 tons, British possessions 1343 tons and other countries 59 tons.

TRAVANCORE RAYON PLANT

The First in India

A RAYON plant, the first of its kind to be erected in India, has started production at Perambavoor in North Travancore, about 30 miles from Cochin harbour. It is run by Travancore Rayons, Ltd.

The factory has been promoted with the support and patronage of the Travancore-Cochin Government and is designed to produce five tons of artificial silk yarn per day. The artificial silk yarn industry is thought to have great potentialities for development in India as the yarn consumption in the country by handlooms exceeded 80 tons per day, costing over Rs.1 million. The entire quantity was now being imported.

The Travancore-Cochin Government recently carried out experiments for the preparation of wood pulp which revealed that bamboo, plentiful in the Travancore-Cochin forests was well suited for making the pulp. The Research Institute at Poona is now carrying out experiments in the preparation of pulp from other similar fibres to the bamboo fibre.

Indian Sources of Sulphur

CONCERN about the absence of natural occurrences of sulphur in India was expressed at a recent meeting of the governing body of the Council of Scientific and Industrial Research of India, presided over by the Prime Minister, Pandit Nehru, in Delhi.

In view of the importance of sulphuric acid for industrial development, it was recommended that the Government of India should construct a pilot plant for the manufacture of sulphur from gypsum, of which adequate supplies are available.

The council also decided that the possibility of making use of copper pyrites and other similar sources of sulphur for the manufacture of sulphuric acid should be investigated.

Alternative Source of Paper Pulp

Paper mulberry is credited with being a good source of raw material for the manufacture of newsprint in India, according to investigations conducted at the Indian Forest Research Institute at Dehra Dun. Newsprint made from this type of mechanical pulp at the instance of the Institute compares favourably with the imported newsprint and is said to be superior in colour and printing properties. Paper mulberry thrives well in the tropics.

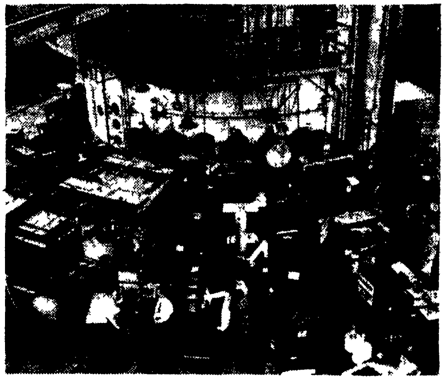
THE HEAVY WATER PILE

Concentrated Research at Chalk River Plant

IN the search for fundamental information indicating how materials behave under intense bombardment, scientists at the Chalk River, Ontario, Atomic Energy Project have surrounded the heavy water pile with a mass of experimental equipment. Concentrated beams of neutrons emerging from the various apertures are guided into these assemblies, which are aligned like spokes of a wheel.

The instrument in the centre of the photograph is a neutron spectrometer, used to determine the structure of certain chemical compounds.

The assembly at the right of the photograph is a special type of electron-pair spectrometer by which energy levels in the nuclei of atoms are investigated. In a study of the structure of a particular nucleus, the high flux of neutrons from the pile is collimated into a narrow beam which is incident on some particular element, for example, aluminium. A neutron enters the nucleus of a particular aluminium atom and the consequent increase of energy (or excitation energy) produces radiations of definite short wavelengths. These gamma rays pass through an obstacle in a magnetic field which converts the ray into a pair of electrons, one positively and one



negatively charged; the magnetic field bends the path of both so that they travel round in opposite directions until they fall on two symmetrically placed detectors, where their incidence is recorded only if they arrive simultaneously. By adjusting the magnetic field—and knowing the dimensions of the apparatus and various other constants—it is possible to deduce energy levels in the nucleus of the aluminium atom.

British Share in the Chicago Exposition

HALF-a-century of chemical progress was reflected in some of the exhibits at the sixth National Chemical Exposition held recently by the Chicago section of the American Chemical Society. This model,

exhibited by the Watford Chemical Co., Ltd., of London, to represent a molecule of glycerol magnified 6400 million times, was constructed mainly of plastics. Inside the " atoms " of hydrogen were shown some of the esters manufactured by the company, based on glycerol and other polyhydric alcohols.

Among the wide range of industrial chemical products shown by the firm were: synthetic caffein and theophylline for pharmaceuticals; a synthetic drying oil to replace tung oil, with good drying and film-forming properties; and a new range of oil additives for the petroleum industry.

U.S. Domestic Copper Price

The price for U.S. domestic copper was established last week at a general level of 24½ cents per lb. This was finally concluded by the Kennecott Copper Company and Phelps Dodge Corporation raising their prices by 2 cents per lb. Other producers and smelters have been charging 24½ cents since last August.

The Chemist's Bookshelf

DDT AND NEWER PERSISTENT INSECTICIDES—T. F. West and G. A. Campbell, 2nd Edition. Revised. 631 + xiv pp. Chapman and Hall, Ltd., 50s.

The first edition of this book was published in 1946, under the title "DDT, The Synthetic Insecticide;" it encompassed 301 pages, so that it was rather less than half as long as this edition. This consists in the main of a collection of abstracts of reports on work carried out with DDT; it contains vastly more information than did the first edition, but it has necessarily become much less "readable." Whereas in 1946 an exciting story of a new discovery was told enthusiastically, the romance is now hidden under a welter of scientific detail of varying quality. Immense trouble has been taken to collect reports of the widespread work carried out on DDT, but little attempt seems to have been made to sift the wheat from the chaff; the book would have been more valuable if the work it summarises had been critically reviewed. That is perhaps too much to expect; as it is Dr. West and Mr. Campbell have provided a standard reference book on DDT which will perform useful service to biochemists and entymologists throughout the world. The pattern of the book is the same as that of its predecessor, and the first 14 chapters are unchanged. The new chapters, on "Benzene Hexachloride;" "Chlordane;" "Toxaphene;" and "Various New Insecticides;" make up rather less than one-eighth of the book; DDT is still the major consideration.

Chlordane and Toxaphene are chlorinated hydrocarbons; their empirical, but not their structural, formulæ are given. Their discovery was a logical development of the discovery of DDT itself.

From the many hundreds of pests whose reaction to DDT is described by West and Campbell, of particular interest is the sheep blowfly, which inflicts incalculable suffering on flocks and severe monetary loss on sheep farmers. Early trials with dips containing ½ per cent DDT suggested that these gave less protection than the commercial arsenic/sulphur dip, but more recent work has shown that "two dippings may be said to have given complete protection from normal strike throughout the season." It would be agreeable if that were the final verdict, but another report states that although the adult blowflies are killed on contact, yet the larvæ of *Lucilia cuprina* (a blowfly) are unhurt by crawling in DDT itself. This is more or less typical of what one finds throughout the book. There appears to be no discussion of the important subject of the emergence of resistant or immune varieties of insects in the second or third year of DDT treatment; probably this is because very little of the work discussed in the text is later than 1946; to some extent this omission is remedied by the inclusion of a bibliography to the end of 1948. Such a time lag pays tribute to the success of DDT; it has become so widely used, its literature so vast that no two people could hope to produce a review that was at once comprehensive and up to date.—R.W.M.

Books Received

PRINCIPLES OF NUCLEAR CHEMISTRY. R. R. Williams. 1950, New York, London and Toronto: D. Van Nostrand Co., Inc. Pp. ix + 307. 28s. 6d.

THE IDENTIFICATION OF MOLECULAR SPECTRA. R. W. B. Pearse and A. G. Gaydon. Second edition revised. 1950, London: Chapman & Hall, Ltd. Pp. xi + 276. 50s.

THE TRANSURANIUM ELEMENTS: RESEARCH PAPERS. Edited by G. T. Seaborg, J. J. Katz and W. M. Manning. Two vols., National Nuclear Energy Series, 4-14 B. McGraw-Hill Book Co., Ltd.

Radiochemistry at Sir John Cass College

A course of six lectures on radiochemistry and radiology has been arranged for the 1950-51 session of Sir John Cass College. The lectures, the first of which will be held on Tuesday, November 7, are to be given by Dr. A. G. Maddock, of the University of Cambridge radiochemical laboratory and Dr. J. F. Duncan, of the Atomic Energy Research Establishment, Harwell. The subject will be divided into six sections: Radioactivity, radioisotopes, radiochemistry, measurement of radiation, preparation of sources for radioactive counting and laboratory practice.

Technical Publications

LIQUID heat engineering is one of the modern methods of heat transfer for which an increasing number of applications are being found. The liquid transfer system is not corrosive, toxic or explosive, offers no serious fire hazard when used in a pump-circulated flow and return pipe system. Chemical properties of one of the heat transfer fluids (tetra aryl silicate) and other particulars of the new transfer medium are given in a leaflet obtainable from Hygrotherm Engineering, Ltd., London.

* * *

ADDED to the many technical publications issued by The Mond Nickel Co., Ltd., is a new publication on aluminium alloy castings. This is based on the paper presented by Frank Hudson, F.I.M., to the congress of The American Foundrymen's Society in May of this year and deals with all aspects of castings in these alloys, including early developments, recent metallurgical practice and modern production methods. A tabulated summary of the many alloys available and a wealth of illustrations showing foundry technique, etc., make this publication valuable to engineers and designers in all industries.

* * *

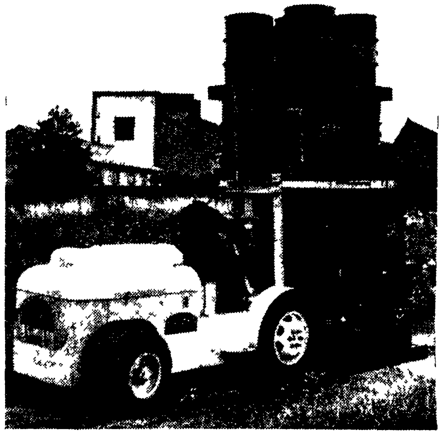
PRACTICAL facts about some commercial grades of kieselguhr, with amusing notes by the way which also convey some useful information about this traditional filter aid, are contained in a brochure available from Chas. H. Windschuegl, Ltd., London.

* * *

CREEP-tested wrought alloys to meet exacting standard specifications are listed in a leaflet recently issued by Henry Wiggin & Co., Ltd., Birmingham. A recent addition to the series, Nimonic 90, containing a proportion of cobalt, has high load-carrying capacities for long periods at 875° to 870° C. Types of wrought alloys not supplied to creep test specification and alloys for remelting are also summarised.

* * *

FROM the discovery of the thermionic emission of the alkaline earth oxides was developed the modern oxide-coated cathode, widely used in the field of electronics. Conduction processes in the oxide-coated cathode are the subject of a paper by R. Loosjes and H. J. Vink in "Philips Technical Review" (Vol. II, No. 9), dealing with technical problems of the Philips' industries—in English, French, German and Dutch.



[By courtesy of Mathew Brothers

Palletised 40-gal. drums of chemicals in pallets of five drums weighing approximately 2200 lb., being lifted during the Matbro truck demonstration

A LOGICAL development of the fork-lift truck, to provide a machine with ample power and heavy tyres which cannot be incapacitated by heavy burdens or rough going, was recently demonstrated in Surrey by Mathew Brothers, Ltd., Wallington. The Matbro forklift truck is suitable for soft and pot-holed ground similar to that met with on open industrial sites and will, of course, operate equally well in normal factory conditions.

* * *

PRACTICAL considerations for insulation and the value of bricks based on diatomaceous earth in procuring heat control and economy are described in the Kimolo (Moler) Technical Handbook No. 1, issued by Cellactite and British Uralite, Ltd., London.

Fish Tasted of Disinfectant

Allegations that fish from the Dee estuary now sometimes taste of disinfectant were contained in a letter cancelling orders from a local fisherman. The letter was read at the final meeting last week of the Dee & Clwyd Fishery Board, whose functions are now taken over by the new River Board. A fishery superintendent pointed out that taint in the local fish could have been derived from sources other than chemicals.

· PERSONAL ·

THE Government-appointed Iron and Steel Corporation of Great Britain, the steel nationalisation authority, has appointed as secretary MR. S. S. WILSON, who, since 1948, has been an Under Secretary in the Ministry of Supply. Prior to that he occupied the equivalent rank in the Ministry of Transport. The Ministry of Supply has released Mr. Wilson in the interests of the new steel group.

SIR EDWARD MELLANBY, of the National Institute for Medical Research and secretary, from 1933-1944, of the Medical Research Council, is among a number of eminent scientists who have been invited to take up appointments in India. Sir Edward will leave England next month to take up his post as director and organiser of the Central Drug Research Institute. DR. ERNEST ZIPKES, of the Federal Institute of Technology, Zurich, Switzerland, has already assumed charge of the Central Road Research Institute in Delhi, while PROFESSOR CHARLES CRUSSARD, professor of physical metallurgy at the School of Mines, Paris, is also expected to arrive in India before the end of the year to become director of the National Metallurgical Laboratory.

DR. TEODOR CANBACK, chief of the pharmaceutical control laboratory of the Pharmaceutical Society of Sweden, was recently in London on his way to the U.S.A. He is to spend some months studying the working of the food and drugs administration there.

MR. J. L. SHARP, of Hawick, who has been appointed a Fellow of the Textile Institute, is assistant manager of the British Cotton and Wool Dyers' Association, Ltd., and is a joint patentee of improvements relating to the treatment of wool. He has undertaken research into the scouring of wool yarn and the dyeing of cotton with sulphur colours. Among the 34 associate members, newly elected in recognition of their success in the institute's examination in general textile technology, is MR. J. E. ROTHWELL, lecturer in textile chemistry at the Burnley Municipal College.

At the 11th annual general meeting of the British Valve Manufacturers' Association the chairman, MR. E. BRUCE BALL (Glenfield & Kennedy. Ltd.), and the vice-chairman, MR. J. M. STOREY (Dewrance & Co., Ltd.), were re-elected in their former capacities.

MR. H. TREFOR JONES, provincial soils chemist in the Yorkshire and Lancashire province of the National Agricultural Advisory Service, has been appointed deputy provincial director for the Yorkshire and Lancashire province in succession to MR. W. WEIR, who has retired.

OBITUARY

The death is announced, at the age of 73, of MR. FREDERIC H. LEES, formerly chief analyst at the Wellcome Chemical Works, Dartford, of Burroughs Wellcome & Co. He retired in 1941 after more than 40 years' service.

The death has occurred of MR. THOMAS MARNS, a past president of the Pharmaceutical Society.

Successful Chemical Engineers

A NOTEWORTHY feature of the 1950 associateship membership examination of the Institution of Chemical Engineers was the large entry from Holland. A new centre for the examination was therefore established at the University of Delft, through the good offices of Professor H. Waterman. Of the 118 candidates, the following 73 satisfied the examiners:—

George Atlass, Francis William Baker, Teunis Bakker, Stanley Brown, Alfred John Urbane Bull, Sydney Henry James Burgess, Kenneth George Burridge, Thomas Bartlett Buyers, Anthony Robert Clark, Colin Evelyn Clark, Harold William Cooper, William Cowling, Vernon Reginald Crane, Thomas Ian Marsh Crofts, John Edwin Cullingworth, Gerardus Wibertus de Vries, James Burnside Diamond, Russel Arthur Nicholas Dixson-Bordoll, Robert Tertius Douglas, John Willoughby Dryden, Frank Wallis Edwards, Johannes Eekels, James Henry Forster, John Frederick Spencer Frith, John Theodore Stephen Gundry, Peter George Range Haines, Alfred Donald Hewitt, John Edward Hickford, Henry Russell Hincklieff, Jack Hofstra, James Richard Horth, Frank Edward Ireland, Jan Jacobi, Edward Charles Anthony James, David Keel Johnson, Charles David Eric Jones, Harry Jones, Waclaw Andrezej Koral, Robert Lindsay Ledger, Johannes Matinus Lintsen, Harry Brian Locke, Ian Ronald McDougall, George McKeand, Ian James Lachlan Macpherson, Victor Christopher Marshall, Charles George Martin, James Harold Mather, Douglas Harold Mellor, Eric Morgan, Kenneth Palmer, James Justin Parsons, James Galloway Thomas Paterson, John Wilfred Pease, Thomas Oliver Penman, Thomas Frederick Perkins, Royston Sidney Pottinger, Richard William Rudin, William Ernest, Russell, John James Settle, John Frederick Sewell, Duncan Shuttleworth, Claude Kenneth Smith, Frank Swire Smith, Leonard Percival Smith, Richard Peter Spalding, Robert Leslie Stephens, Saxon John Glenville Taylor, Douglas William Thrift, David Traill, Donald Hugh Trethewey ,Johannes Marimus van Brummelen, Gerrit van den Berg, Rodger Walker, Israel Wilenitz, Ronald Douglas Wilkinson, Reginald Edward John Williams, Albert Ernest James Yelland.

• HOME •

Refined Oil Prices Unchanged

There will be no change in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period ending December 2.

BSI in Manchester

The British Standards Institution has opened a branch office at 12 Hilton Street, Manchester 1 (Central 4856, Telegrams: Bristandin, Manchester) of which Mr. A. F. B. Nall, assistant technical director of the Institution, is in charge.

U.S. Microfilm Equipment to be Made Here

Manufacture of microfilm equipment in the U.K. has been arranged by an agreement between Mr. J. Arthur Rank and an American firm. The equipment will be put on the British market and will also be exported.

Wider Use of Shrink Resisting Process

An agreement reached between the Board of Trade and the dyers and finishers which will come into force shortly will permit utility rayons, particularly spuns and crepes, to be made shrink resistant. At present, the process is used only for non-utility fabrics which are subject to purchase tax. The processing will involve an extra cost of between 3d. and 4d. per yard for those fabrics in which it is employed.

Chemical Employment

Numbers employed in the chemical and allied trades in July remained steady, the total figure (in thousands) being 446.6 compared with 445.5 in June. Detailed distribution, as shown in the *Ministry of Labour Gazette*, was as follows: Coke-ovens and by-product works 17.2; chemicals and dyes, 204.4 (151.4 men, 53.0 women); pharmaceuticals, etc., 34.1 (13.9 men, 20.2 women); explosives, etc., 36.1; paint and varnish, 38.8; soaps, glycerin, etc., 49.1; mineral oil refining 36.2; oils, greases, glues, etc., 30.7.

NCB Scholarship Awards

The National Coal Board has awarded 80 university scholarships, in mining engineering and allied subjects, to 49 miners and 31 schoolboys. This is the third successive year in which the Board has offered 100 scholarships, to be divided between men in the industry and boys who have taken their Higher School Certificate. Most of the awards are for students to read mining engineering, a few are for mechanical and electrical engineering.

New Chrome Ore Price

The prices of chrome ore, Baluchistan metallurgical grade, are announced by the Ministry of Supply to be these: *ex* ship, £12 19s. 6d.; *ex* store, £13 17s. per ton delivered. The last quotation, on May 13, was (*ex* ship) £12 0s. 6d. per ton.

Virgin Zinc Quotas

Restriction of the amounts of virgin zinc that can be acquired by consumers in the United Kingdom has become necessary owing to shortage of the metal. From October 1 until further notice consumers will be allowed to purchase from the Directorate of Non-Ferrous Metals not more than nine-tenths of their average monthly consumption in 1949.

Tin Nears Price Record

The price of tin on the London Metal Exchange fell slightly on October 4, but hardened on the following day, strengthening on October 6 by a further £11 to settlement at £830. On October 9 the spot price rose £14 10s. to £843-£848 a ton, nearing the record established in August of £850. Settlement on the closing session was £845.

Pure Benzene

Among the products of the Catarole process Petrochemicals, Ltd., is producing large quantities of very pure benzene and toluene. These compounds are of a purity approaching analytical reagent standard and have a narrow boiling range, a very low acid wash number and only slight variations in specific gravity. They are designed for use in processes which can only operate satisfactorily with very pure chemicals. Another of the company's products, Catarex benzene T.F., which contains not more than 2 p.p.m. of thiophene, is available on a commercial scale and is suitable for catalytic processes.

Scottish Plant for the Colonies

Chemical engineering interests were well represented at the "Engineering for the Colonies," exhibition recently held in the Engineering Centre, Glasgow. Among the plant supplied to the 28 Colonial markets by Glasgow and West of Scotland firms were oil and sugar refining plant, machinery for handling molasses and distillation plant. Other equipment included rubber handling machinery and wine processing apparatus. Among the leading suppliers were Babcock and Wilcox, Ltd., Glenfield and Kennedy, Ltd., and Clyde Tube Forgings, Ltd.

The Stock and Chemical Markets

STRONG buying of British Funds carried long-dated stocks to their highest levels this year—3½ per cent War Loan to 97⅛. This was attributed partly to foreign demand for sterling securities on the assumption that, although no immediate change is expected, an upward revaluation of sterling may be inevitable next year. Industrial shares generally, however, showed only moderate response to the big rise in gilt-edged stocks, partly because of fears of higher taxation and lower dividends in 1951. Commodity shares, particularly rubbers, on the other hand, were good. Rubber rose sharply to 4s. 1½d. per lb. earlier in the week, while tin has advanced to its highest figure since free dealings were resumed.

Chemical and allied shares were firmer in most cases. Imperial Chemical, after declining to 41s. 3d. recently following talk of more nationalisation plans to come, rallied sharply to 41s. 9d. Fisons eased to 26s. 3d., but were later 26s. 9d. Monsanto showed firmness at 51s. Albright & Wilson 5s. ordinary shares held steady at 30s., with the new 5 per cent preference at 1s. 9d. premium. Boake Roberts were 31s. 6d., Brotherton 20s. 3d., F. W. Berk 11s. and Laporte Chemicals 5s. units 10s. 7½d. Helped by good trading results, L. B. Holliday 4½ per cent preference were 20s. Amber Chemical 2s. shares held 2s. 9d., and Bowman Chemical 4s. shares were 5s. 3d. W. J. Bush were up to 85s. 6d. and the 5 per cent preference 22s. 9d.

There were very active dealings in the new Lever & Unilever 3¾ per cent debentures, which on the first day of dealings reached a premium of 28s. 9d. over the issue price. The company's ordinary units rose sharply to 44s. on market opinion that there may be a prospect of the Dutch Lever N.V. increasing its dividend which would mean more from the English company because of the dividend equalisation agreement between the two concerns. It is pointed out, however, that it is quite impossible to forecast financial results of a world-wide organisation such as this, particularly as profits may depend to a large extent upon commodity prices and whether the rising trend in costs can be checked.

British Celanese were again active up to 25s., pending the dividend announcement. There has been continued market talk of a forthcoming new issue of capital. The higher price for the metal strengthened British Aluminium slightly to 44s. 9d., and there was further activity up to 27s. in Triplex Glass shares, although British Oxygen lost a few pence at 93s. 9d. Turner & Newall at 83s. 9d. have been firm and, United Molasses were steady at 46s. and the 4s. units of the Distillers Co. active around 19s. 7½d.

Iron and steels were easier on the announcement that February 15 is to be the vesting date when steel shares are to be transferred into the new nationalisation steel stock. Steel shares remain well below their scheduled take-over prices, news of the vesting date having led to further selling by holders who do not wish to transfer into steel stock because of the big loss of income that will be involved. It is generally assumed in the market that steel stock will be a fairly long-dated 3½ per cent stock issued at par, but this will depend on the general level of gilt-edged prices next February.

Glaxo Laboratories eased to 50s. after an earlier further rise, Boots Drug at 49s. 6d. have been steady, but oils were uncertain, with Anglo-Iranian higher at £6⅞, although Canadian Eagle Oil eased to 26s. 6d. on the new issue.

Market Reports

ACTIVE trading has continued throughout the industrial chemicals market and the demand from home users has been well maintained, both as regards delivery specifications and the placing of new business. A steady flow of overseas inquiry has been reported and bookings for shipment are believed to be well up to recent levels. A number of price changes, the result of the recent substantial rise in the price of molasses (THE CHEMICAL AGE, 63, 495), have tended to diminish incidental dealings in some spirits and solvents. The quotation for lithopone is now £44 2s. 6d. for quantities of 1 ton and over. Business in the coal tar products market remains active and carbolic acid, creosote oil and cresylic acid are in strong request.

MANCHESTER.—A steady demand has been reported on the Manchester market during the past week for most lines of heavy chemical products. Home-trade inquiry from the principal industrial outlets has covered a wide range and replacement buying has been going forward satisfactorily. Shippers' inquiries relating to parcels for the Empire and other export

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BAIRD & TATLOCK (LONDON), LTD., laboratory furnishers, etc. (M., 14/10/50.) September 6, debenture to Industrial & Commercial Finance Corporation, Ltd., charged on properties specified and a general charge (subject to etc.). *Bankers to limit of £200,000. April 19, 1950

BENNETT (HYDE), LTD., (Ches.), manufacturers of rosin, etc. (M., 14/10/50). September 7, charge to Williams Deacon's Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and works, Boston Mills, Hyde. *Nil. September 20, 1949.

C. E. UNDERHILL & SONS, LTD. (formerly C. E. UNDERHILL & CO.. LTD.), Callington, chemists. (M., 14/10/50.) September 11, £2500 (not ex.) mortgage to Lloyds Bank, Ltd.; charged on bungalow, etc., known as the Glade Grove, Harrobarrow, Calstock. *Nil. March 7, 1949.

JOSEPH WELLS & SONS, LTD., Dartford, pyrotechnists. (M., 14/10/50.) September 11, mortgage to Midland Bank, Ltd., charged on Springate, Joyce Green Lane, Dartford, and fixtures. *Nil. October 1 1949.

Satisfaction

CROYDON CHEMICAL CO., LTD., (formerly CHOCROLL, LTD.), Croydon.—(M.S., 14/10/50.) Satisfaction September 19, of debentures registered November 12, 1937, to the extent of £1000.

Receivership

ALBION SOAP CO., LTD., 48 Gowers Walk, Commercial Road, E.1. (R., 14/10/50). Mr. Cyril Cantor, A.C.A., of Ling House, 10/13 Dominion Street, South Place, E.C.2, was appointed receiver and manager on September 5 under powers contained in debenture dated March 31, 1949.

Company News

Glaxo Laboratories, Ltd.

Group profits of Glaxo Laboratories, Ltd., for the year ended June 30, 1950, after providing for all charges and U.K. taxation, amounted to £1.239 million (£933,398). A final dividend of 12½ per cent on ordinary stock is recommended and £150,000 is to be placed to reserve for future research and development.

Thomas W. Ward, Ltd.

The report of Thos. W. Ward, Ltd., for the year ended June 30, shows a total profit of £442,964 after providing for taxation and charges. A final ordinary dividend of 10 per cent is proposed, making a total of 15 per cent for the year. A sum of £558,726 is carried forward to the current year.

New Address

Audley Engineering Co., Ltd., valve manufacturers, of Newport, Shropshire, has changed its London offices to 2, Caxton Street, S.W.1; Telephone ABBEY 2041.

P. B. Cow & Co.

Since the publication of the announcement last week that the Board of Trade had appointed two inspectors to investigate the affairs of P. B. Cow & Co. (THE CHEMICAL AGE, 63, 519) a statement has been issued by the directors stating that the present and future trading position of the company is satisfactory.

The notice received by the company from the Board of Trade specifically referred to the promotion of the company and the prospectuses dated August 13, 1947, and October 26, 1948.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

outlets have been fairly numerous. Firm price conditions continue in most sections. A moderate aggregate weight of new business in fertilisers has been placed and there is a steady trade in both the light and heavy tar products.

GLASGOW.—The Scottish heavy chemical market has shown considerable renewed activity during the past week. Prices are firming daily. Export business continues steady with, unfortunately, in many instances a shortage of supplies.

Next Week's Events

MONDAY, OCTOBER 16

Royal Institute of Chemistry

Dartford: The Bull Hotel, 7.30 p.m. Brig. J. S. K. Boyd: "Some Chemotherapeutic Problems in Tropical Diseases."

Society of Chemical Industry

London: Chemistry Lecture Theatre, Royal College of Science, South Kensington. 2.30 p.m. "Iodinated Proteins and Thyroxine in Animal Husbandry" by Dr. K. L. Blaxter.

Leeds University: Chemistry Lecture Theatre. 7 p.m. Jubilee Memorial Lecture: "Solid and Catalytic Reactions" by Professor W. E. Garner, C.B.E., D.Sc., F.R.S.

TUESDAY, OCTOBER 17

Institute of Petroleum

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Joint meeting with the Society of the Manufacturers of Petroleum Equipment.

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. A. E. Crawford (Mullard Electronics, Ltd.): "Ultrasonics."

Textile Institute

Macclesfield: Memorial Hall, 7.45 p.m. Chairman: G. M. Swindells. Talk and film—"Air Conditioning."

Society of Chemical Industry

Newcastle-upon-Tyne: "Potassium Deposits in North-East Yorkshire" by Dr. A. Fleck.

Bradford Chemical Society

Bradford Technical College: 7 p.m. "The Chemical Structure of Wool" by Dr. S. Blackburn.

WEDNESDAY, OCTOBER 18

Royal Institute of Chemistry

London: Cora Hotel, Upper Woburn Place, W.C.1, 3.30 p.m. Symposium: The Chemist as: (a) An administrator—D. W. Hill; (b) A company director—W. D. Scott; (c) A technical salesman—R. S. Tarring; (d) An information officer—S. E. Fox.

Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. The Melchett Lecture. Prof. R. J. Sarjant: "Ignipotence."

Manchester: Engineers' Club, Albert Square, 2 p.m. (with Institute of Petroleum). E. Bonwitt and H. E. Charlton: "The Fuel Heat and Power Aspects of the Petroleum Chemicals Plant for Petrochemicals, Ltd., Partington."

THURSDAY, OCTOBER 19

The Chemical Society

Manchester: The University, 6.30 p.m. (Joint meeting with RIC and SCI). Prof. R. D. Haworth: "The Chemistry of the Tropolones."

Society of Chemical Industry

Belfast: Queen's University, 7.30 p.m. (Joint meeting of the Food Group with the Northern Ireland Section). Dr. J. B. M. Coppock: "The Application of Science in the Baking Industry."

Institution of Structural Engineers

Manchester: Reynolds Hall, College of Technology, 7 p.m. A. V. Booth—chairman's address; sound film "Welded Structures."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. E. Ayres and A. Hill: "Centrifugal Casting."

FRIDAY, OCTOBER 20

The Chemical Society

Aberdeen: Marischal College, 7.30 p.m. (Joint meeting with RIC and SCI). Dr. R. Hurst: "Recent Work on the Transuranic Elements."

Birmingham: The University, Edgbaston, 4.30 p.m. Dr. E. J. Bowen: "Chemistry and the Scattering of Light."

Plymouth: Technical College, 5 p.m. (Joint meeting with RIC and SCI). M. B. Donald: "The Basic Principles of Chemical Engineering."

St. Andrews: United College, 5 p.m. Prof. J. Read: "Historical Science as an Instrument of Culture."

Oil & Colour Chemists' Association

Manchester: Midland Hotel. Reception 6.45-7.15 p.m. (Manchester Section). Silver Jubilee dinner and dance.

Atomic Scientists' Association

London: Royal Institution, Albemarle Street, W.1. Two-day meeting with the Institute of Biology on the "Biological Hazards of Atomic Energy."

SATURDAY, OCTOBER 21

Society of Leather Trades' Chemists

Manchester: Engineers' Club, Albert Square, 2 p.m. Dr. Burton: "Vegetable Tanning"; W. L. Roberts: "A Repairer's Viewpoint on Leather."

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Dyestuff preparations comprising leuco-sulphuric ester derivatives of vat dyestuffs.—Imperial Chemical Industries, Ltd., and A. Topham. Jan. 24 1949. 644,904.

Dyestuff preparations comprising leuco-sulphuric ester derivatives of vat dyestuffs.—Imperial Chemical Industries, Ltd., and A. Topham. Jan. 24 1949. 644,819.

Corrosion-preventing means for ferrous metal hot water tanks.—McGraw Electric Co. Feb. 17 1948. 644,825.

Siliceous dispersions.—D. A. W. Hill, C. Shaw and W. E. Langrish-Smith. Feb. 18 1949. 644,908.

Treatment of waste liquors containing iron sulphate.—Imperial Chemical Industries, Ltd., J. W. R. Rayner, J. H. Hudson and G. W. Ettle. Feb. 21 1949. 644,826.

Esters of mixtures of polyoxyalkylene monohydroxy compounds. — Carbide & Carbon Chemicals Corporation. Feb. 26 1948. 644,828.

Curing polymeric materials.—Imperial Chemical Industries, Ltd., D. H. Coffey, O. B. Edgar, T. J. Meyrick and J. T. Watts. March 7 1949. 644,829.

Distributors for granular and other loose material.—A. W. S. Pring. Feb. 10 1949. 644,710.

Manufacture of diaryl amines.—J. R. Howden (E. I. Du Pont De Nemours & Co.). March 19 1948. 644,938.

Process for the production of oxygen-containing organic compounds.—Naamlooze Vennootsschap De Bataafsche Petroleum Maatschappij. April 14 1948. 644,665.

Manufacture of calcium, barium and strontium.—Soc. Electro-Metallurgique Du Planet. April 20 1948. 644,941.

Production of aromatic carboxylic acids. —E. I. Du Pont De Nemours & Co., W. F. Gresham and C. E. Schweitzer. Feb. 22 1949. 644,667.

Apparatus for measuring humidity.—Foxboro Co. May 12 1948. 644,675.

Method of and apparatus for temporarily increasing the output of propulsive gases from a combustion chamber.—Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. May 14 1948. 644,719.

Polymers of monovinyl-phenoxthines.—British Thomson-Houston Co., Ltd. May 24 1948. 644,677, 644,678.

Preparation of 5-alkyl-5- (1[1], 2[1]-dibrom-2[1]-phenylethyl)-hydantoins .— Galactina & Biomalt Soc. Anon., and H. Kramer. June 9 1948. 644,722.

Method and means for the inertia separation of suspended matter from gases. —Directie Van De Staatsmijnen in Limburg. June 22 1948. 644,868.

Process for producing precious metals.—O. W. Haugen. July 6 1948. 644,954.

Rubber, latex or the like rings and process of making same.—Elastrator Co., Ltd. July 13 1948. 644,729.

Hardening treatment of casein or the like protein fibres.—Courtaulds, Ltd., L. E. Hodges and R. L. Wormell. July 20 1949. 644,958.

Uniting bodies by melted glass.—Sylvania Electric Products, Inc. Aug. 3 1948. 644,691.

Polishes and methods of preparing same. —E. R. B. Maunsell. Feb. 19 1949. 644,692.

Purification of selenium.—K. Krebs (H. Krebs). Aug. 24 1949. 644,743.

Alminium alloys.—H. C. Hall. Sept. 2 1949. 644,695.

Sensitive photographic emulsions.—J. H. Christensen. Oct. 4 1949. 644,970.

Apparatus for contacting gases or vapours with liquids.—Imperial Chemical Industries, Ltd., and G. J. Williamson. Sept. 21 1949. 644,976.

Means for the detection and quantitative determination of combustible gas or vapour in an atmosphere.—G. Malecki. April 23 1946. 645,252.

Isolation of anhydrous organic compounds from aqueous solutions thereof.—Merck & Co., Inc. May 1 1946. 645,253.

Decomposable substances such as vitamins and other food supplements.—R. P. Dunmire. Aug. 28 1946. 644,988.

Anti-friction elements of the graphite type for bushes, packings, joints, washers and the like and method for manufacturing same.—Soc. Le Carbone-Lorraine. Sept. 10 1946. 645,126.

Method and apparatus for electroplating.—Cleveland Graphite Bronze Co. October 10 1946. 645,183.

Production of solid depolarisation electrodes from active carbon for atmospheric oxygen elements.—Spolek Pro Chemickou a Hutni Vyrobu, Narodni Podnik. Oct. 31 1946. 644,990.

Resinous laminates and production thereof.—St. Regis Paper Co. Feb. 18 1947. 645,257.

Detergents.—California Research Corporation. April 16 1947. 645,129.

Processes of preparing thioxane derivatives and the compounds resulting therefrom.—Monsanto Chemical Co. May 9 1947. 645,130.

Method of making titanium-containing copper alloys.—Chapman Valve Manufacturing Co. June 12 1947. 645,003.

Base surfaces of articles, non-fibrous flexible films forming said base surfaces and pressure-sensitive adhesive tapes employing said base surfaces.—Minnesota Mining & Manufacturing Co. June 12 1947. 645,057.

Process and an apparatus for forming a filter on a filter body.—Dwars, G. June 12 645,260.

Immunization of hogs against hog cholera. American Cyanamid Co. June 17 1947. 645,058.

Rubberlike multipolymers containing a conjugated diene hydrocarbon.—B. F. Goodrich Co. July 22 1947. 645,263.

Methods of producing alpha-naphthoquinones and the alpha-naphthoquinones resulting therefrom.—Velsicol Corporation. July 23 1947. 645,061.

Sulphonation products of cashew nut shell liquid and the like.—Harvel Corporation. July 28 1947. 645,062.

Insecticidal compositions.—Harvel Corporation. July 31 1947. 645,132.

Inorganic oxide gels of spheroidal shape. Soconoy-Vacuum Oil Co., Inc. July 31 1947. 645,133.

Production of phosphoric esters.—Eastman Kodak Co. August 8 1947. 645,134.

Mineral oil composition.—Socony-Vacuum Oil Co., Inc. August 25 1947. 465,267.

Process for production of oxygenated sulphur compounds.—Standard Oil Co. August 28 1947. 645,268.

Method of growing crystals.—Patelhold Patentverwertungs- & Electro-Holding Akt.-Ges. Sept. 10 1947. 645,136.

Preparation of polymerisable pentachlorostyrene, its polymers and copolymers.—Mathieson Alkali Works. Sept, 22, 1947. 645,065.

Purification of aqueous solutions of sugar.—American Cynamid Co. Sept. 29 1947. 645,192.

Manufacture of textile treatment agents.—Imperial Chemical Industries, Ltd., W. Baird, T. Barr, E. S. Lane, and A. Lowe. Oct. 6 1948. 645,138.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

THE INSTITUTION of CHEMICAL ENGINEERS

EXAMINATION, 1951

Application forms, (returnable 1st December, 1950) and particulars of the Associate-Membership Examination for 1951 may be obtained from the Hon. Registrar, **INSTITUTION OF CHEMICAL ENGINEERS, 56, VICTORIA STREET, WESTMINSTER, LONDON, S.W.1.**

SITUATIONS VACANT

CHIEF RESEARCH CHEMIST. Heavy organic chemical manufacturing company need a Chief Research Chemist to take charge of expanding research department. Appropriate experience is essential and the salary will be £1,500 or over according to applicants ability and qualities. A suitable house will be made available if necessary. Reply to Box No. C.A. 2954, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

THE Civil Service Commissioners invite applications for permanent appointments as **ASSISTANT EXPERIMENTAL OFFICER** to be filled by competitive interview

The posts are in various Government Departments and divided between following main groups and subjects (a) Mathematical and Physical Sciences, (b) Chemistry and Metallurgy, (c) Engineering Subjects and (d) Miscellaneous (including e.g. Library and Technical Information Services). No further applications can be accepted from Biologists, Geologists or Meteorologists.

Interviews will be held throughout the remainder of the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced either for the competition as a whole or in one or more subjects.

Candidates must be at least 17½ years and under 26 years of age (or under 31 for established Civil Servants of the Assistant (Scientific) Class) on 1st August, 1950; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with mathematics or a science subject as a principal subject, or an equivalent qualification; but candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £230-£490. Salaries for women and for posts in the provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

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Dwindling Sulphur Supplies

SULPHUR, the alchemists' "fiery element," has become an especially fiery subject for British chemical industry in 1950. In the past few weeks a serious sulphur emergency has arisen. Supplies of sulphuric acid to manufacturers of superphosphate have been drastically reduced; according to statements circulating in the fertiliser industry cuts of the order of 50 per cent have been made. Even in 1940-45 scarcities had consequences less violent and abrupt, and the present situation was certainly not unpredictable. Less than 18 months ago the Committee on Industrial Productivity pointed out in its first report: " . . . our supplies of natural sulphur are at present drawn almost exclusively from the U.S.A. This is not only expensive in dollars, but it renders us unduly dependent on a single source of supply." One result of the heightening of international tension has been reluctance in the U.S.A. to continue exporting sulphur at anything like the pre-Korean rate, and so the sword, long suspended over British chemical industry, has fallen. The superphosphate process, requiring 11 cwt. of strong acid for every ton of superphosphate it makes, has taken the full weight of this blow.

Since the first world war, the sulphur-based process for sulphuric acid manufacture has heavily predominated. Technically the combustion of sulphur is much easier to manage than the combustion of sulphur-containing minerals of more variable composition. Nevertheless, other materials for sulphuric acid manufacture — the sulphide-bearing pyrites of Continental countries and the spent oxide of our gas and coke-oven industries—are at least near at hand. Whatever short-term merits the use of sulphur may have had, such factors as the general uncertainty of supplies, aggravated by the decline in quantity of Italian-mined sulphur and its uneconomically high cost, have called for a re-estimation of the policy. The Committee on Industrial Productivity foresaw this when it pressed for greater encouragement of the use of indigenous raw materials (anhydrite, spent oxide) and for a more balanced policy in the importation of sulphur and sulphur-containing materials. Their 1949 recommendation is now invested with an urgency which was not recognised at the time.

What has now occurred was in fact foreseen many years ago. The late Mr. P. Parrish, a frequent contributor to THE CHEMICAL AGE, drew attention on several occasions to the need of alternative sources, particularly in connection with the superphosphate industry's requirement of sulphuric

On Other Pages

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acid. He advocated a much closer integration of the fertiliser industry and chemical sections of the gas industry so that the neglect and wastage of sulphur in spent oxide did not continue; in 1939 he predicted the recovery of 12 lb. of sulphur per ton of coal carbonised and indicated that spent oxide, containing 50 per cent sulphur, could be provided in quantity 300 per cent larger than the amount being used in acid manufacture at that time.

Manufacturers and users of sulphuric acid will naturally hope that the present contraction in our American imports will be only temporary. They will do well to remember that world reserves of raw sulphur are declining seriously. The sulphur position of countries without natural sources of their own is likely to become increasingly critical even when "strategic" controls are a thing of the past. The rapid expansion of world populations and corresponding food needs make it inevitable that the annual demand for such fertilisers as superphosphate will increase. New methods for processing rock phosphate which would greatly reduce the employment of sulphuric acid are an alternative solution requiring equal attention. From now on, the writing on the wall is apparent to all. Events have caught up with prophecy.

Industrial chemistry has so far concentrated mainly upon natural sulphur and sulphides as materials for acid. Minerals which contain sulphur in the fully oxidised sulphate form are far more abundant, and reasonably so in the United Kingdom. Recent research by the Chemical Reseach Laboratory has shown that sulphates can be reduced by bacterial organisms. In some small lakes in the Libyan desert elementary sulphur is being steadily produced by natural bacterial processes. From the samples of these micro-organisms brought back to this country it is possible that pure cultures can be obtained and more active strains developed. Artificial production lakes might then become a practical possibility. The large-scale biological production of sulphur from sulphates is certainly not impossible, although it remains to be seen whether an economic rate of reduction could be secured. As so often in chemical history, the intensification of a supply problem and the first glimpse of a possible solution have arrived simultaneously.

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First Report of the Committee on Industrial Productivity. April, 1949. (HMSO)
"Superphosphate and Compound Fertilisers" by P. Parrish and A. Ogilvie. (Hutchinson), 1939 and 1946.
THE CHEMICAL AGE, 63, 329.

Notes and Comments

Cortisone

NEWS of dramatic " cures " by the newer materials isolated by the biochemists are currently regarded with such suspicion by the experts that the confirmation by British clinicians of the " dramatic " relief of arthritic patients by the cortisone derivative of the chloric acid of ox bile was not a work of supererogation. The force of that has been made evident by the magnitude of some of the claims made in the U.S.A. for some of the related steroids, by which the search for the means of relieving countless thousands of sufferers from rheumatoid arthritis might have been diverted into false channels. We now have the testimony of eight undoubted experts of several London hospitals that 17, hydroxy 11 = dihydrocorticosterone—cortisone or " Compound E "—can in effect produce " miraculous " freedom from all the crippling disabilities of rheumatoid arthritis—for just as long as the supply of cortisone holds out. In these first trials in Britain—or in Europe—the duration was 10 days, during which four of the women patients experienced "dramatic" relief and one showed " marked improvements ". The confirmation of the great hopes raised by the reports on the initial experiments in America's Mayo clinic in 1948 were made possible by yet another example of generosity from the U.S.A., in this instance from the Mayo Clinic's Dr. Philip Hench and Dr. J. M. Carlisle of the Merck Company.

Other Steroids

THE British contribution to the conclusive tests of the crystalline Compound E, the provision of several related steroids, progesterone, androstenedione, pregnenolone, and others, was perhaps no less important in the ultimate result than the precious supply of cortisone. It enabled the London clinicians to affirm beyond doubt that the related steroids are useless in their present form in the context of rheumatoid arthritis. Progesterone alone provided any evidence which might conflict with that conclusion. The facts of which the medical witnesses have presented the usual ample and well attested proofs in the *British Medical Journal* (*4684*, 849-854), narrow the field in which the biochemists can be relied on to pursue this vital search for an adequate alternative source of cortisone. It will have to reproduce exactly the characteristics of the steroid derivatives of corticosterone—a double bond between the carbon atoms 4 and 5, an oxygen on carbon atoms 3 and 20, an oxygen or hydroxyl group on carbon 11, and a hydroxyl group on carbons 17 and 21.

Publicity Programme

THE forces which operate more forcibly now than ever before to oblige chemical industries to shed their reluctance to raise a voice in public have gained significant new ground. That is evidenced in particular by the inclusion in the 34th annual report of the Association of British Chemical Manufacturers (*page 562 this issue*) of a summary of fairly recent enterprise, which suggests a partial conversion to the doctrine that an intelligent public relations programme is a suitable part of its work. Many, aware of the misrepresentation for political ends of iron and steel, cement and some other industries, would award a much higher priority to the task of representing a true picture of chemical industries to the rest of the country, which the association's publicity committee has now shouldered. The association's first target is the BBC, whose proved willingness to present chemistry and general science subjects has inevitably accentuated the virtual exclusion of all discussion of their natural corollary, the practical use of this new knowledge in Britain's chemical producing plants. The ABCM has now had the enterprise to recommend programme themes to the BBC and is to help members make

similar contacts with Broadcasting House with some hope of acceptance. Many will hope that this rather belated token that the ABCM does not disregard the value of well informed publicity indicates the acceptance of a more liberal view of the Association's responsibility as spokesman for an important section of industrial chemistry. These proposals will certainly not go unrewarded if they banish some of the reticence which has in the past left the public more ignorant of the sources of the chemicals and intermediates of everday use than of almost any other common commodity.

186,282 Miles a Second

THE announcement by the Department of Scientific and Industrial Research that an inaccuracy, small but significant, has been detected in a universally accepted fundamental constant by a National Physical Laboratory scientist is news which will have more than statistical interest for scientific workers. Apart from the normal implications of this discovery —that light travels at 186,282 miles a second, not 186,271—for example, the greater accuracy which the use of the new value of the velocity of light will allow in radar and radio techniques—such an admission of error in one of the three most important physical constants may serve as a salutory reminder. The acceptance of scientific calculations should always be tempered by the reflection that "this figure will suffice only until it can be shown to be wrong". Theoretically at least, that is the traditional approach of all scientists. Many would agree, however, that there is still room for underlining the need for an element of healthy scepticism towards published scientific data, which is liable to command exaggerated respect simply because it appears in print. This is not an argument for light-hearted attempts by all and sundry to prove that the experts are wrong, or even not perfectly right. But when legitimate and reasonable doubts exist there is clear obligation at least to attempt to verify quantitative experiments. As Dr. Essen has shown, re-investigation sometimes proves most fruitful—for those who can command the knowledge and equipment—sometimes elaborate.

Technologists' Centre

THE possibility that Birmingham will become one of the country's most active centres in forwarding the interests of applied science in many forms gains strength from the disclosure made in the city a few days ago that the well-integrated technical and scientific societies have advanced plans for a "Technical House." The proposal to set up in the heart of Birmingham, at a possible cost of £250,000, a centre for the exchange of ideas in science and engineering is said to have the support of about 25,000 members of Midland scientific and technical societies, represented by a standing joint committee, which has already reached the stage of submitting plans to the city council. It would have a conference hall large enough for 750 auditors, larger, in fact, than some in the metropolis which have been the scene of transactions of historic importance, and several smaller theatres for gatherings of 250 or 100, and a museum. This would, incidentally, provide for the new Midland group of the Institution of Chemical Engineers a conference centre worthy of the larger scale consultation between practitioners here and overseas which the rapidly evolving concepts in chemical engineering require. The great benefit of facilities of that kind is keenly recognised in Birmingham and has been crystallised in a few words by the chairman of the local section of the Royal Institute of Chemistry, Dr. S. H. Jenkins. From such exchanges, he says, can evolve ideas more valuable than those originating in the laboratories. The Birmingham project, which is admitted to be, at the moment, more a vision than a fact, could supply the perfect counterpart of the other ambitious proposal, to provide in London a "science house" where all the scientific bodies could enjoy the same unity.

RAPID GROWTH OF CHEMICAL INDUSTRY

ABCM Chairman Foresees World Dangers of Over Production

THE acceleration this year of the rate of chemical production, reflecting the substantial headway made in the rehabilitation of chemical plants and the construction of new ones, was made evident in the course of the annual meeting in London last week of the Association of British Chemical Manufacturers.

The chairman, Sir Harry Jephcott, in his review of the association's work in relation to economic and other changes in chemical industry, recalled some significant comparisons in production figures. He called attention in the report to the Board of Trade (the Report on Chemical Industry) which mentioned that the index of production in the chemical and related trades was close on 120 in 1948, compared with 100 taken as base-line in 1946. The figure in 1949 was 123, while in the first quarter of this year there was a really substantial advance to 133.

A further advance might be confidently expected as the various schemes of expansion and rehabilitation come to fruition.

Export trade (he said) has been well maintained. Exports in the chemical group of the Trade and Navigation Accounts which were valued at £22 million in 1938, increased to £86 million in 1949. When the necessary adjustment for price changes has been made the volume of exports in 1949 was 160 as compared with 100 in 1938. From the figures available for the first eight months of this year we may expect a substantial increase over 1949 and may well reach the £100 million mark. This is a very fine performance, especially when you remember that we have carried out the instructions of the President of the Board of Trade to give first claim on our production to home demands for chemicals.

Imports

The import position is also interesting. In 1938 we imported chemicals to a value of nearly £14 million. Although this figure had increased in 1949 to just over £25 million, when price changes are taken into account the 1949 amount is only about 80 per cent of that in 1938. This year imports have risen substantially, in spite of the higher volume of production, doubtless due to increased demands from consuming industries in the U.K. Thus, for the first eight months of this year the imports were a little over £23 million; if they continue at the same rate they will top a total of £35 million for the whole

Mr. L. P. O'Brien, chairman of Laporte Chemicals, Ltd., and several associated companies, and an officer of fullers' earth and barytes organisations, who is to serve for a second year as ABCM president

year, an increase of 40 per cent on 1949. You will thus see that we have considerable scope and outlets for increased production at home as well as overseas.

As requested by the Government, we have taken an active part in the dollar drive—not, I am glad to say, without success. The U.K. published figures show that in the first eight months of this year we sold to the U.S.A. chemicals to the value of £2.6 million, compared with £1.13 million in the corresponding period of 1949.

For Canada the progress is even greater. In the first eight months of 1950 we sold to Canada chemicals to the value of £2.7 million as compared with £970,000 for the corresponding period in 1949.

While the devalued £ sterling has helped us, we must remember that to get the same amount of dollars an extra volume of 40 per cent of goods is required. The 1950 figures therefore represent about 100 per cent increase in volume over 1949.

What of the future? There has been a gradual extension of liberalisation in the various countries of Western Europe, which means that import licensing will be abolished over a wide field of international trade and that there will remain only tariffs to protect the industries concerned. We may expect to see some tariff reductions as the result of the Torquay talks now in progress, but it is doubtful whether these will be substantial, especially as

America, the prime mover some years ago in urging the reduction of tariffs and trade barriers, has refused to consider any lowering of her very high tariffs over a wide field of organic chemicals, including dyestuffs.

The European Payments Union, which comes into operation on January 1, 1951, should still further widen the field of liberalisation. It should also, we hope, render unnecessary those bilateral trade agreements, with what might be called their detailed shopping lists, found so restrictive of trade in the past. The result of all these activities should be to increase the opportunities for our export trade; at the same time we may expect increased competition both here and overseas, but this should act as a stimulus to our selling efforts.

The rearmament programmes of the Western Allies will influence the size and nature of the demand for our products, and are likely to cause shortages in some of the chemicals required for munitions. Acute shortages have already arisen in certain lines and America is now buying from abroad some products that she was previously selling in her export markets.

There is, however, a longer-term danger to which attention has been drawn in various quarters; it is already causing anxiety in some Western European countries. Several countries are now building up branches of the chemical industry that they did not possess before. Some of the plans published by the OEEC, if brought to fruition, are likely to result in a productive capacity exceeding any immediately foreseeable demand; dyestuffs are a case in point.

Fears have been expressed that, unless these ambitious schemes for expanding chemical manufacture in Europe are co-ordinated, acute over-production will lead to intense competition that will not be in the best interests of the industry or of those employed in it.

There are many who doubt the ability of the OEEC machine to effect the necessary co-ordination. The problems are of such complexity that they cannot be fully appreciated except by those engaged in the industry. Therefore, just as it is necessary to have a co-ordinated scheme of defence for Western Europe, it would appear desirable to have some similar co-ordination in those industries on which the defence must rely for war materials; I have in mind some simple system by which the industries affected in Western Europe can discuss their common economic problems. Some of the difficulties over the visits of productivity teams to the U.S.A. have now been resolved. A team from the pharmaceutical industry has been accepted and will sail on November 1. We hope that it will be possible to send other teams envisaged and organised.

Amplified Production and a Publicity Plan

THE annual report of the ABCM for the year ended June 30 discusses, *inter alia*, the gradual improvements of the supply position of dyestuffs. It states that a steep rise in the demand for certain individual dyestuffs in the vat, azoic, oil soluble and pigment ranges has contributed to periodic shortages during the year, but the shortages are expected to disappear as new plant comes into operation. A number of dyestuffs not previously available from British makers have been placed on the market, thus making their importation unnecessary.

During 1949 the U.K. dyestuffs industry achieved a record export figure of almost £9 million, and had maintained that rate in the first six months of 1950 without detriment to the needs of home consumers.

Members of the association and of the Association of British Pharmaceutical Industries interested in the production of synthetic organic chemicals that might have properties liable to produce drug addiction, have co-operated with the Home Office and the Medical Research Council in formulating proposals for the voluntary control of the issue of new products of the kind. Those proposals have been generally accepted and new synthetic drugs of this type will now require the approval of the Home Office before being generally issued to doctors.

The association's publicity committee has investigated very fully the BBC's present programmes dealing with industrial matters and has drawn up suggestions for new broadcast features, to assist the BBC's selection of its winter programmes.

The committee has also prepared and circulated a summary of experience in methods of approach, which should be helpful to member firms seeking the inclusion in BBC programmes of information about matters in which they are interested.

The committee is examining the possibility of preparing a handbook for the BBC and the Press showing the members of the association from whom industrial information on a wide range of chemical subjects can be obtained. It has also considered a number of other matters such as methods of securing editorial publicity in the popular magazine field.

CHEMICAL MANUFACTURERS' DINNER

Bodies for Motor Cars or Containers for Chemicals?"

THE significance of the fact that Britain was now exporting chemicals to the U.S.A. in appreciable quantities was emphasised by Sir Harry Jephcott, chairman of the Association of British Chemical Manufacturers, at its annual dinner in London on October 11. During the first seven months of this year, he said, Britain's chemical exports to America had risen from the $4.8 million attained in the corresponding period last year to $6 million. Our chemical exports to Canada —also dollar exports—had in the same period also risen from $3.4 million to $5.2 million. He and the council of the ABCM thought that was a real accomplishment, and they hoped that their friends at the Ministry of Supply and the Board of Trade saw it in the same light.

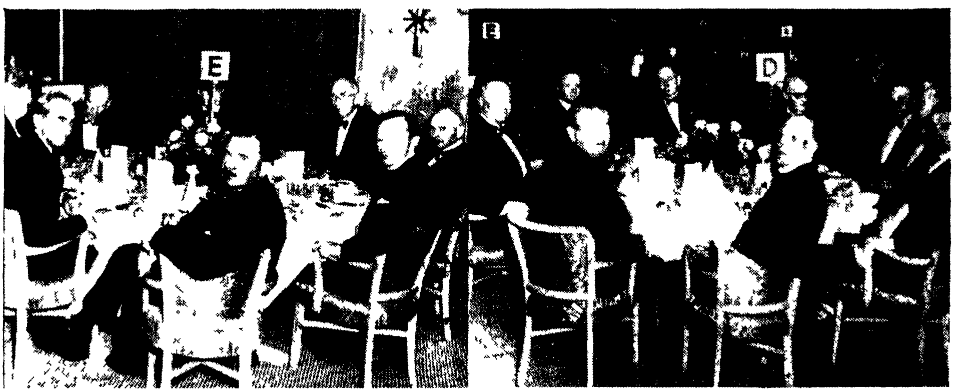
Sir Harry Jephcott, who was proposing the health of the guests, called attention to the fact that: "If you are to export chemicals you have to put them in something." He recommended that their friends of the Civil Service would have to decide whether they wanted bodies for motor cars or containers for chemicals. Nevertheless, their friends in the Government departments had, he acknowledged, been very helpful and understanding in the way they approached the chemical trade's problems in general and co-operated.

Productivity in the chemical industry had lately increased quite satisfactorily, and in the early part of this year had been quite remarkable. In their sphere, however, productivity did not depend principally on man-power, as it did in some other industrial spheres; it was a question of rehabilitation of plant and the development of new processes. Both meant capital expenditure. He did not know the extent to which the Government was relying on additional productivity in industry to help the armaments drive, but if calls were to be made on the chemical industry he hoped the Government would not put them in the position of being "the residual legatee" in the matter of capital expenditure.

FBI's Rôle

He gladly acknowledged the happy relationship of the ABCM with its related associations. To one, the Federation of British Industries, whose president was their principal guest that evening, the ABCM and all the other trade and industrial associations willingly paid their allegiance. The FBI was industry's channel of communication in all broad matters of policy between the Government and industry, and it had become of very great importance to all who were concerned with British industry.

When, three years ago, he first became chairman of the ABCM, continued Sir



Dinner parties: With Sir Harry Jephcott (third from right): Sir Robert Sinclair, Sir John Woods, Sir Robert Robinson, Sir Ben Lockspeiser, Mr. W. K. Hutchison, Sir Archibald Rowlands, Professor H. P. Himsworth and Sir William Douglas. Right: With Dr. Lampitt are Mr. C. F. Merriam, Mr. W. A. Damon, Dr. Norman C. Wright, Mr. W. E. O. Walker-Leigh, Dr. E. R. A. Merewether, Dr. H. E. Watts, Professor A. Haddow and Professor E. K. Rideal

Harry Jephcott, he said to himself: "I suppose these trade associations do some good." After three years, he knew that they not only did good, but that their own association was an essential and an integral part of the chemical industry.

Most of their scientific societies had been experiencing difficulties, one of the chief being the high cost of printing and publishing the matters they existed to propagate. As a result of the appeal for funds which had been made in that connection, he was pleased to be able to announce that the Chemical Council was now assured of £30,000 a year for a minimum of three years. £26,000 of that was being provided annually by members of the ABCM. He appealed to all who had not yet responded to that call to do so.

Planning Perils

Sir Robert Sinclair, K.C.B., K.B.E., president of the Federation of British Industries and chairman of the Imperial Tobacco Company (of Great Britain and Ireland), Ltd., responding to the toast, recalled the chairman's reference to the part the FBI played in liaison with the Government departments. That brought him to the subject of "planning"—which he knew none of them liked any more than he did. It was clear, however, that as long as there were currency restrictions and regulations, industry would have to put up with a certain amount of central planning. With them, however, he believed that planning had got to be kept down and that it would be a bad thing for industry if we ever got down to detailed planning. Of some of the recent examples of planning—steel, for instance—industry took a poor view.

Industry's Views

Having apologised for introducing party politics into a social gathering, he observed that as a result of the experience of the last few years many in industry had come to the conclusion that it was of no use presenting industry's views to "our present lords and masters" because industry's views were diametrically opposed to the views of the Government. He did not take that view. "We have got to represent to whatever Government is in power what industry really feels." The feelings of industry were based on good reasoning and good sense, and he was confident that truth and reason would eventually prevail. Views represented to the Government would be listened to so long as they were truly representative of what industry was thinking.

Referring to the Anglo-American Council of Productivity, Sir Robert Sinclair said that at the time of its inception he and a good many others were filled with considerable misgivings. They saw in it infinite opportunities for the worsening of relations between the two countries. They foresaw the possibility of a sort of detailed American inspection. He was glad that those forebodings had been entirely without foundation. That council was set up with the good will of the Americans and, with a very happy selection of members on the British side, had achieved a very great work. He was concerned that the work of that council should be encouraged in every possible way.

Among the principal guests present

Mr. G. P. Barnett, Chief Inspector of Factories; Prof. G. M Bennett, Government Chemist; Mr. F. M. Birks, president; Institution of Gas Engineers; Mr. W. A. Damon, Chief Alkali Inspector; Sir Wm. S. Douglas, secretary, Ministry of Health; Dr. W. H. Garrett, chairman, Association of Chemical and Allied Employers; Sir Ian Heilbron, chairman Advisory Council, D.S.I.R.; Sir James R. C. Helmore, second secretary (home), Board of Trade; Prof. H. P. Himsworth, secretary, Medical Research Council; Sir Norman Kipping, director-general, F B I.; Dr. L. H. Lampitt, hon. Foreign Secretary, S.C.I.; Sir Ben Lockspeiser, secretary, D.S.I.R.; Dr. E. R. A. Merewether, chief medical inspector of factories; Prof. D. M. Newitt, president, Institution of Chemical Engineers; Prof. E. K. Rideal, president, Chemical Society; Sir Robert Robinson, president, the Royal Society; Mr Stanley Robson, president, S.C I.; Sir Archibald Rowlands, permanent secretary, Ministry of Supply; Dr. H. E. Watts, chief inspector of explosives; Sir John Henry Woods, permanent secretary, Board of Trade

ABCM Officers

THE election as president for 1950-51 of Mr. L. P. O'Brien, chairman of Laporte Chemicals, Ltd., and of associated companies was announced after the annual general meeting of the Association of British Chemical Manufacturers in London on October 12.

Other officers elected were these:—

Vice-presidents: Dr. F. H. Carr, C.B.E., R. Duncalfe, Dr. E. V. Evans, O.B.E., Dr. P. C. C. Isherwood, O.B.E., Sir Harry Jephcott, C. F. Merriam, M.C.

Elected members:—Chairman, C. G. Hayman; vice-chairman, W. F. Lutyens; hon. treasurer, C. E. Carey; Sir Frederick Bain, M.C., A. D. Daysh, Dr. A. E. Everest, G. E. Howard, L. G. Matthews, T. D. Morson, D. P. C. Neave, F. G. Pentecost, Derek Spence, G. F. Williams, K. H. Wilson, H. Yeoman.

Co-opted members: B. A. Bull and I. V. L. Fergusson.

Honorary vice-presidents: N. N. Holden, Lord McGowan.

Director and secretary: J. Davidson Pratt, C.B.E. Manager, A. J. Holden.

STEEL FOR WELDED PRESSURE VESSELS

Requirements of New BSI Specification

THE 48 specifications for ferrous metals —excluding tubes and pipes used for identical fittings—associated with the new BSI Code (No. 1500) for fusion-welded pressure vessels are to be published as BSS 1501-1506. They will cover all the forms in which steel is used for the construction of pressure vessels—plates, sections, forgings, castings and bars.

Eleven main types of steel in the form of plates are dealt with, ranging from "tank quality" carbon steel for very low pressure vessels to chromium-nickel-molybdenum stainless steels; also 11 types of forgings, 12 types in the form of castings and 16 types of bars for bolting.

All the steels included are required for specific applications, they are produced in significant quantities and, while they represent only a small percentage of the variety of steels theoretically possible or desirable, they cover the bulk of industrial requirements in the pressure vessel field.

This was stated by Mr. J. W. Strawson (Shell Refining and Marketing Co., Ltd.) at the recent meeting in London (THE CHEMICAL AGE, 63, 530) called by the Institution of Chemical Engineers to discuss the new code.

Some of the types of steel were divided into sub-grades, but, even allowing for the sub-division of each of the 11 types of plate steel, only 21 varieties of steel plate were included in the British code, as compared with the 39 varieties and grades included in the ASME boiler code. Mr. Strawson observed that the committee had achieved some measure of rationalisation there. The steel specifications would provide, for the first time in one work, a schedule of British standards for steels suitable for the manufacture of pressure parts.

Printing Delays

It was regretted that bottlenecks in the printing industry had prevented earlier publication of that part of the code, but it was perhaps a tribute to the versatility of BS 1500 that it had, in fact, been possible to administer the code even in the absence of final specifications for the materials, partly, he believed, because many had seen advance copies and were generally acquainted with the requirements.

Publication of those specifications was announced by the BSI in its last monthly information sheet, and copies were likely to be generally available within the next few weeks. The new material specifications would include the usual low-carbon mild steels which covered the main tonnage demand for steels for pressure vessel construction; a carbon-manganese steel giving a rather higher tensile weldable steel; carbon-molybdenum steels for service at elevated temperatures, particularly in the range 800°-950° F.; a range of chromium-molybdenum steels of increasing chromium content to provide resistance to certain mildly corrosive conditions; and chromium-nickel and chromium-nickel-molybdenum austenitic stainless steels for increasingly severe corrosive environments.

Relation to U.S. Standards

In order to remove any doubt which might exist as to whether a batch of steel supplied to other specifications would meet the requirements of the code, tables were included in BSS 1501-1506 listing the correlation between those specifications and equivalent British and American standards. Those tables should be extremely helpful to manufacturers when they were asked to quote for plant against American drawings which referred to what might be unfamiliar material specifications. The committee regretted that it had not been possible to extend the correlation to include Continental steels.

Most of the properties necessary in a steel which had to operate at sub-atmospheric temperatures had been given a good deal of thought and consideration. It was felt that specifying a minimum impact value of 20 ft. lb. on a standard Izod notched test piece should suffice to ensure that only material with adequate toughness would be used, the test to be made at the service temperature. No attempt had been made to deal with that aspect by specifying restricted chemical compositions, or by making the use of alloying elements obligatory; it was felt to be better done by specifying the mechanical properties required.

The problem was really one for the steelmaker, who could often extend the range of usefulness of the ordinary mild steels simply by the choice of suitable steelmaking techniques. Mr. Strawson did not think that steel specifications should, normally, restrict the chemical composition of a steel unless the presence, or absence, of particular elements were essential to the successful performance of the steel in a particular service. The steel-

maker, therefore, was to be left to produce a suitable steel for each particular low temperature application, using the most economical procedure, while the purchaser reserved the Izod test to measure the success of the steelmaker's efforts.

Mr. W. Robson (I.C.I., Ltd.), congratulating the committee on the document, said it was necessarily ambitious and his company intended to use it and encourage its use. He assured the committee that any criticisms he might make would be made in the hope of enabling them to improve it further. Obviously the code had been prepared very largely with a mild steel background; in respect of austenitic steels it was by no means so complete, and information in relation to non-ferrous materials was conspicuously absent. Non-ferrous materials had not been used very widely in pressure vessels yet; many non-ferrous materials were still in their infancy, and quite a number of features about them were still being investigated.

Low Temperature Working

On the mild steel side, Mr. Robson said he would have liked to have seen more definite information concerning vessels to work at sub-zero temperatures within the limits in which mild steel was considered suitable, probably down to about − 30°C., and also concerning the temperatures at which the tests on such vessels should be carried out, in order to ensure a uniform quality of material. He felt that the allowable working stresses given were definitely on the high side as regards the austenitic steels. However, in some detailed comments which his organisation would submit, they hoped to say why and to suggest alternatives.

If one were designing a non-ferrous vessel and used some of the methods of construction shown in the code—which in themselves were very suitable for mild steel construction—one might be in trouble. He wondered whether, in view of the paucity of information given, it would not be better, for the present, to leave out of the code the non-ferrous pressure vessel side, so that it would confine itself to steel pressure vessels.

In a reference to the length of the provisional period of the code, Mr. Robson suggested that one year was far too short. Although there were many who had a background on pressure vessels, they had not got it specifically in connection with this code, and he understood that that was what the committee wanted. He recommended strongly that the provisional period be extended for, say, another year. The various concerns interested could immediately submit provisional comments on the code as it existed at the moment, which comments could be considered by the committee during the next year; then the interested concerns could be asked to submit their final comments at the end of that year.

Other speakers supported Mr. Robson's suggestion to extend the provisional period of the code for another year.

Mr. L. Marsden (I.C.I., Ltd.), referring to the provisions made in the code for safety valves, said his company bought these to a specification for strength. It was a routine matter to try them out under the fluid with which they were to operate, by attempting to release the pressure and then re-seat them. They were lucky nowadays if they could re-seat two or three times; and he had grave doubts about safety valves being used, after once operating, without being taken out and reconditioned. He suggested the committee might consider the possibility of defining, for chemical plant use, some test for reseating safety valves prior to delivery.

Mr. J. F. Lancaster (The A.P.V. Co., Ltd.), who said he was concerned with the application of the code to welded vessels in non-ferrous metals, agreed with Mr. Robson's remarks concerning the grave results which could arise from applying some of the welded joint designs that were illustrated in the code to such metals as aluminium and copper. Only too often, he said, draughtsmen attempted to design copper and aluminium vessels as they would design those made of steel and one did not wish to encourage them in that process.

Defects in Aluminium Welds

Some of the requirements for the testing of welds did not apply to aluminium and copper in the same way as to stainless steel. For example, said Mr. Lancaster, there were defects in aluminium welds which were not picked out effectively by radiographic examination, in particular the oxide film inclusions, which could be dangerous. The whole question of weld examination required reconsideration in respect of non-ferrous materials. Underlining Mr. Robson's point, he suggested that pressure vessels in non-ferrous materials should be covered, if possible, by another code, an addendum to BSS 1500.

SIMA's New Headquarters

The Scientific Instrument Manufacturers' Association of Great Britain, Ltd., (SIMA) and the British Scientific Instrument Research Association (BSIRA) announce that their address is now 20 Queen Anne Street, London, W.1. Telephone: LANgham 4251-2.

RESEARCH THEMES AT THE CRL

DSIR Programmes in 1949

CONSERVATION of essential materials, the advancement of separation and purification techniques and the production of fundamental reference data were among the principal pre-occupations of the Chemical Research Laboratory (DSIR) during last year.

The wide programme carried out at Teddington, and elsewhere, in collaboration with research associations and individual firms has been summarised in the current annual report (1948-49) of the Department of Scientific and Industrial Research.

Modernised laboratories and some new equipment, such as a grating spectrometer and an electron diffraction camera have permitted further expansion of the themes for current study by the DSIR chemists.

The laboratory's expansion of precise reference data in the interests of research and analytical chemists and engineers concentrated last year upon the preparation of pure chemical compounds, notably the heterocyclic substances present in coal tar. Now that the required apparatus has been assembled, extension into other fields may be expected.

New Chemicals for Research

This department has undertaken the responsibility of obtaining pure hydrocarbons, to be used for mass spectrometer standards, from the United States, and the subdivision of these bulk samples for distribution to other laboratories in Britain. Furthermore, a scheme for the preparation in the laboratory of research chemicals not made in this country has been prepared. Here again the main emphasis is on purity, and already samples of pure stearic acid and decosane has been supplied to the engineering division of the National Physical Laboratory for lubrication studies.

The laboratory is also collaborating in the inorganic field on the supply of pure metals. Recently a committee was set up to co-ordinate the preparation of pure metals for research and development purposes. The committee has recommended the formation of a stock collection of pure samples of metals not readily available.

The extension of this work is expected to lead to much useful information on the presence and determination of impurities in metals. Comparison of different supplies of a particular element may well result in a raising of the level of purity generally available, and the existence of a survey, giving complete data on the purity of materials from different sources, should be of considerable value to research.

Striking advances are reported to have been made in the application of chromatography to the separation of inorganic compounds. This new technique involves the use of cellulose, or other absorbent material, and organic solvents which may contain additional reagents. By this means many important separations have been effected. There has been much interest in these developments, which will undoubtedly find applications in analysis and purification of materials.

Among the work done by the laboratory on the utilisation of indigenous raw materials is the examination of flue dust as an important source of gallium and germanium. A considerable quantity of gallium has now been acccumulated and samples of the pure metal have been distributed on loan to various research laboratories for study. One interesting property discovered is that its thermal and electrical conductivities vary in a ratio of 1 to 7 according to the orientation of crystal growth.

Canada Intensifies Mineral Research

THE present shortage of industrial minerals required by Canada's rapidly expanding chemical, construction, and manufacturing industries, and the consequent urgent need for research to promote the development of new sources, has required an Industrial Minerals Division to be established in the Mines Branch of the Department of Mines and Technical Surveys. The department receives many calls from industry for work on these minerals and the establishment of the new division will enable it to meet these increasing requirements to better advantage. Mr. M. F. Goudge, who has been in charge of the department's work on industrial minerals for a number of years, will be at the head of the new division. In particular, he will direct the programme of investigation into the processing and utilisation of non-metallic minerals. All the significant mineral resources in Canada have in the past been indexed and the indexing of occurrences of the non-metallic minerals is well advanced.

U.K. POTASH DEPOSITS

140 Years' Supply in Eskdale?

A WORKABLE field of potassium chloride, sufficient to supply the United Kingdom for 140 years, has been proved by borings in one area alone in Eskdale, Yorkshire.

This was stated at a meeting of the Society of Chemical Industry at Newcastle-upon-Tyne on October 17 by Dr. Alexander Fleck, a director of I.C.I., Ltd. Dr. Fleck added that this was the estimated yield from the proved area of only 12 sq. miles. He believed that much more than this existed and there was at least as much potassium in the form of polyhalite which might have industrial potentialities.

Sylvinite, containing mineral potassium chloride, had been discovered at a depth of about 4000 ft.

Dr. Fleck indicated that there were considerable variations both in thickness of the potassium-containing strata and in the content of potassium chloride. By comparison with deposits at present commercially worked in other countries those in Eskdale lay appreciably deeper. There were certainly two workable beds of sylvinite, the easiest of the common potash-bearing ores. Both beds lay nearly horizontal and were not contorted steeply. The upper bed compared well in thickness and potassium chloride content with the average of the commercially worked beds. The potassium chloride content of the lower bed was probably as good as that of any worked bed, and its thickness was only rarely exceeded in any known potash field. I.C.I., Ltd., believed that the proved area alone contained 213.5 million tons.

Dr. Fleck added that the borings had also disclosed a bed of Keupar salt, 100 ft. thick. Of the Eskdale deposits, about 35 per cent would probably be recoverable.

Overseas Trade in September

THE provisional value of U.K. exports in September was £171.4 million, which was £8 million less than the average for the first eight months of the year. This compares with £142 million in September, 1949. Exports to the U.S. in September were provisionally estimated to be £10.4 million, 29 per cent above the average for the first eight months of 1950. Exports to Canada were £10.1 million, £2.1 million lower than in August but slightly above the monthly average for 1950.

PLANT PROTECTION

Expanded Search and Production

THE substantial extensions of the laboratories and technical and production departments of Plant Protection, Ltd., were officially opened at Yalding, Kent, on October 16, by Sir Wallace Akers, director of I.C.I., Ltd., one of the two parent companies by which Plant Protection was created 13 years ago.

Sir Wallace Akers said that from the I.C.I. laboratories some 2000 separate compounds were sent every year to Plant Protection's establishments to see if they were of value to agriculture. It was the Yalding centre's responsibility to see how much could be put into condition for use and to determine how they should be used —as powder, solution, the droplet size, etc.

In the enlarged laboratory block, Plant Protection, Ltd., has a compact unit providing analytical control of its factory, a chemical laboratory for formulation work, a library and a new semi-works-scale laboratory. The operations of the works are mainly the grinding and blending of dusts, the emulsification of liquids and the manufacture of dispersible powders.

World Zinc Control

THE eventual need for international or world control of zinc was foreseen last week by Mr. R. L. Wilcox, chief of the non-ferrous metals branch of the Economic Co-operation Administration. He said, in Washington, that consumption of zinc at the present rate could not be maintained. World production gave a surplus of 54,000 metric tons above consumption, but the 167,000 metric tons estimated to be required by the U.S. Government for reserve would result in a deficit of 113,000 tons.

Solution of these problems, in his view, would seem to lie in control of the metal by a combined materials resources board with absolute control of production.

U.S. Drive for Aluminium

THE United States Munitions Board has asked American producers to draw up plans to expand aluminium production. The Board requires to know to what extent production could be raised by June, 1953, and by June, 1954.

Another branch of the Government, the National Resources Board, has asked producers to specify how long it would take the industry to increase its aluminium capacity by 1 million lb. or 3 million lb.

HEAT AND LIGHT STABILISERS

Main Requirements for the Vinyl Plastics

From A CORRESPONDENT

SUCCESS in the factory processing and fabricating of vinyl plastics, notably polyvinyl chloride, is influenced to a large extent by the efficiency and suitability of the incorporated stabiliser. Its primary function is to neutralise the small amount of hydrogen chloride which is released from the polymer when it is exposed to light and heat, hence the alternative description of "HCl Acceptors." If the stabiliser is not present or present in insufficient quantity there is a strong probability that auto-catalytic decomposition will take place. That is accompanied by a noticeable darkening in colour, embrittlement and eventual disintegration.

A large number of chemical compounds is now being offered to the plastics industry as stabilisers, some of which exercise good lubricating properties. These additives include metallic soaps, such as cadmium, barium and calcium stearates, basic white lead carbonate and phosphate. tin and strontium organo-compounds of unknown composition, and non-metallic organic compounds, particularly certain aryl ethers. The last named are assuming growing importance because of their ability to exert an external plasticising effect on polyvinyl chloride and polyvinylidene chloride.

Physical and Functional Differences

Some of these stabilisers, such as the metallic stearates, are free flowing powders, while others are light viscosity liquids or solvent solutions; *e.g.*, some strontium stabilisers are made up as solutions in a ketone and can be readily used in vinyl solutions for coatings as well as organosols. For many purposes the powder form is preferable as it is mixed easily and thoroughly with the polymer prior to milling.

Choice of stabiliser is influenced by several considerations, some of which relate to processing and others to the heat-sealing and even printing of films; *e.g.*, the presence of metallic fatty acid soaps may present certain difficulties in this regard. Manufacturers of vinyl film for packaging purposes sometimes prefer to use organic tin stabilisers, which are free from fatty acids.

Toxicity and freedom from odour are other important factors which need some thought, particularly for the production of films and manufactured goods which are to come in contact with the body or with food. Calcium and strontium are safe metals and can be recommended for use where innocuous additives must be employed.

Although the primary function of the stabiliser is to protect the vinyl resin from the damaging effects of light and heat, many stabilisers, especially the metallic soaps, possess good lubricating and release properties. When present in the vinyl compounds to the extent of 2 per cent they are able to promote smooth, rapid extrusion and to minimise the tendency of compounds to adhere to heated calender and mill rolls. It is also claimed that compositions containing metallic soaps show increased resistance to moisture.

Essential Qualities

The main requirements of a good stabiliser can be usefully summarised thus:—

1. It must impart a high degree of protection against deterioration caused by heat built up during processing of the plasticised or unplasticised composition on mixing rolls, calendering rolls, in extruders and during the actual moulding. Some of the more recent stabilisers, such as cadmium stearate, are able to give a high degree of protection against degradation due to exposure to temperatures of 340° F. for prolonged periods.

2. The stabiliser should possess the ability to protect vinyl compounds from the effects of ultra-violet light. Some of the heat stabilisers in percentages not exceeding 2 are able to give protection for more than 500 hours in a high intensity carbon arc weathering unit. Light stability is of the greatest importance for transparent calendered films finding applications as a textile replacement material and for packaging.

3. The stabiliser must not affect the colour or clarity of the processed vinyl product. This is particularly important with film. Some metallic soaps introduce an objectionable haze into transparent films; lead stearate suffers rather badly from this defect.

4. The additive should contribute to the chemical stability of the vinyl product which is very susceptible to attack by sulphide fumes, etc. Barium stearate is one of the stabilisers now being used to give

added protection to the resin when exposed to hydrogen sulphide.

5. The stabiliser should be in a form that is readily dispersible in common plasticisers. Particle size is important for powders and it is recommended that some 99 per cent of the additive should be able to pass through a 200 mesh screen.

6. Water soluble salts present in the stabiliser should not exceed 0.5 per cent. It is essential that no part of the stabiliser should be leached out of the processed vinyl product when it is exposed to the elements.

7. The chemical inertness of the stabiliser must be of a high order and particular care needs to be taken to ensure that it is not affected by the pigments introduced into the vinyl compound.

8. Toxicity must be low, particularly where the vinyl product is to be used in contact with food. Calcium and strontium stabilisers can be safely recommended for the light stabilisation of transparent packaging films for the food industry.

9. The additive should impart high lubricating and release properties so that all fabricating processes benefit from the presence of the stabiliser. It can, of course, be argued that separate lubricants are invariably added to the vinyl product, but there is an undoubted advantage in employing dual purpose stabilisers.

10. The price per pound should be low, bearing in mind that appreciable quantities of stabiliser are used in the manufacture of vinyl-wrought products and finished goods.

There is, unfortunately, no such thing as the perfect stabiliser, but there is now available a range of highly efficient compounds which offer several advantages over the early additives, such as lead carbonate and lead stearates.

A good deal of attention is now being given to the claims of mixed stabilisers, such as cadmium-barium stearates.

The degree of stabilisation imparted by a metallic stabiliser is governed by the quantity of solubilised metal which can be introduced into the vinyl composition. It is important that metallic soaps enable compounds to be produced containing different percentages of metal; *e.g.*, with two lead stearates one may be twice as effective as the other because of its higher metal content.

Factors Affecting Solvent Performance

IT has been found that while certain liquids will dissolve bituminous coals of low rank at room temperature, others will not, and that any particular liquid falls into either of these two classes. Chief among the former class, "specific solvents," are the primary aliphatic and certain heterocyclic amines.

Commenting upon work previously published on this subject I. G. C. Dryden of the British Coal Utilisation Research Association, in a communication to *Nature* (166, *4222*, 561) says that a comparison of solvent power data has now shown that this property bears little relation to the internal pressure, surface tension, dielectric constant or dipole moment of the solvent. The moderate correlation with internal pressure probably reflects conditions under which, because of the incipient pyrolysis of the coal, most liquids are moderately effective "solvents" and specific factors are less important.

At atmospheric pressure, on the contrary, the following rules have emerged. A specific solvent (for example, an aliphatic primary amine) contains a nitrogen or oxygen atom with an unshared pair of electrons which, however, may be prevented from promoting solvent power by (1) excessive hydrogen bonding, *e.g.*, in amines diluted with water, or in ethylene glycol as contrasted with ethylene diamine; and (2) by participation of the lone pair in resonance of the molecular nucleus, *e.g.*, in aniline and pyrole as contrasted with benzylamine and pyridine. Nitrogen compounds are generally better solvents than those compounds containing oxygen (compare primary amines with alcohols, which are very weak in solvent power).

Alkyl groups tend to reduce solvent power: diethylamine is one of the most effective precipitants for removing coal extracts from solution in specific solvents, and is an important factor determining the lack of solvent power of secondary and tertiary aliphatic amines. Solvent power is further modified by molecular size, viscosity and by inductive effects which influence the availability of the unshared pair.

The heat of interaction of various amines with aluminium chloride has recently been used as an approximate measure of the coordinate bond-energy. Amines fall into the same relative order as that found when they are arranged according to their ability to swell and dissolve lower-rank bituminous coals, thus further confirming the conclusion that an electron-donor mechanism is concerned in the interaction between these coals and amines.

(*continued at foot of next page*)

MEMBRANE PERMEABILITY

*Investigation by Three Methods**

THE membranes surrounding living cells are capable of maintaining a difference in osmotic pressure between the two sides. Living cells are in dynamic equilibrium and alteration of the rate processes may cause changes in the membrane, affecting its permeability.

Membranes may be formed by the operation of surface tension forces alone. Natŭral membranes of animal origin, contain proteins and lipoids, the bacteria, mucoids, and magnesium ribonucleate and the plants cellulose. The physiologist attempts to explore the nature of natural membranes *in vivo*, while the physico-chemical approach is to make models and find which model behaves most naturally. The monolayer technique reveals that membranes behaving as osmotic barriers must be multimolecular in thickness.

Three different types of membranes are recognised; the so-called sieve or capillary membrane, the liquid or oil membrane, and the membrane consisting of a polymer.

The problem of permeability has been attacked both by direct passage, by osmotic and by emf methods. Each has contributed some information of value. Capillary membranes may consist of relatively large pores, as in aggregations of particles of different sizes of laminar sheets, as in charcoal, or even of molecular pores, and as in the zeolites.

Tortuosity Factor

Our interest is in the tube areas and lengths. The latter involves a tortuosity factor. The Kozeny-Carman treatment of void fraction and surface area neglects in vapours the surface flow along the capillaries; and in liquid absorption, application of the Kelvin equation leads to the assumption of an immobile adsorbed layer of liquid. The work of Michaelis on the emf across sieve membranes has been reinterpreted by Meyer and Teorell in terms of two Donnan restraints on each side of the membrane and a number of fixed charges inside the membrane.

The permeability constant P, *i.e.*, the number of c.c. at normal pressure and temperature of gas passing through a square cm. and a thickness of 1 mm. in one second is the product of the diffusion constant D and the solubility constant S. The former may vary as the membrane concentration of dissolved vapour changes.

The permeability of polymer membranes is determined by the number of Eyring holes in the membrane capable of holding molecules of the penetrant, and the movement through the membrane is determined by the microbrownian movement of the non-crystalline chain segments of the polymer.

Movement

Movement is thus a property of the polymer; the permeation process requires an energy of activation and is not a free diffusion; solute molecules suffer a large change in entropy when "dissolved" in a polymer, i.e., are rather tightly held; the microbrownian movement of the chain segments likewise involves consideration of the ratio of fringe to micelle in the "fringed micelle" type of polymer.

Some penetrants can peptise the micelles, others cannot do so. If such a polymer membrane is expanded by solvent or plasticiser it passes over into the capillary type, which has already been discussed.

The oil type of membrane seems to bear the closest analogy to natural membranes which may consist of a lipoid-like material held in an open network of cellulose, or in the form of a lipoid lipo-protein complex mosaic.

The reactions at the interface between the membrane boundaries and the homogeneous phases can be studied by the monolayer technique. Here the control of the mechanism of chemical reactions by surface tension changes, as well as the phenomenon of penetration, is all-important.

* Abstract of Professor Rideal's Procter Memorial Lecture at the annual conference of the Society of Leather Trades' Chemists during September 22-23, at the University, Leeds.

FACTORS IN SOLVENT PERFORMANCE

(continued from previous page)

Particularly striking is the great difference between primary, secondary and tertiary aliphatic amines observed in the case of their interaction with tributyl boron.

The observations with coal therefore indicate that the electron acceptor on coal surfaces is surrounded by alkyl or other groups projecting from the surface. Inertness of secondary and tertiary aliphatic amines was observed only when butyl groups were attached to the boron.

IDENTIFYING VEGETABLE OILS

Effective German Alkali Isomer Test

RICINENE oil, obtained by dehydrating castor oil and sold under various trade names, has become a valuable addition to linseed and wood oils in the manufacture of paints, varnishes, and alkyd resins. Originally it was obtained by the Scheiber method, using free fatty acids, but nowadays it is more often produced by dehydrating castor oil direct with catalysts. Formerly, it could easily be identified by its chemical constants, *e.g.*, diene number (20) and iodine number (about 155) so that it was not liable to be confused with natural drying oils.

Specific Test

Since the introduction as paint oils of many similar processed materials a specific test for ricinene oil has become essential. Dr. J. D. von Mikusch has recently described such a test. (*Farben, Lacke, Anstrichstoffe*, 1950, *4* (9), 337-8 Sept.).

Ricinene oils obtained by the usual methods in most cases still have marked optical rotation, namely, dextro of 2-7°; but their distilled fatty acids may have no such rotation. Since some natural oils, such as sesame, may be also dextrorotatory this cannot serve as an indicator for ricinene oil. It is possible, however, to distinguish dehydrated castor oil from similar products by its content of linoleic acid isomers and its consequent behaviour in alkaline isomerisation.

Theoretical considerations and experimental work led to the conclusion that, in the dehydration of castor oil four isomeric octadecadienic acids may be formed, of which two have their conjugated double bonds in the conjugated (9,11) position and two in the isolated position (9,12). Of the latter one, the cis, cis-compound, is identical with natural linoleic acid, while the other is the 9 cis, 12 trans-octadecadienic acid not found in nature. Similarly the 9,11-octadecadienic acid of ricinene oil may have both the cis, cis- and the cis, trans-configuration.

It would appear from this that the cis-double bond of ricinoleic acid is not elaidinised during dehydration. That this assumption is normally correct is apparent from the differing behaviours of ricinoleic and ricinelaidinic acids in dehydration. Only from the latter is formed the Mangold (trans, trans) 9,11-linoleic acid of m.p. 54° C.

In examining the natural oils containing linoleic acid the usual (cis, cis) linoleic conjugated product of relatively low m.p. is obtained by alkali isomerisation. Treatment of the cis, trans-linoleic acid with excess alkali, however, yields a high-melting point (trans, trans) 10,12-linoleic acid, which may easily be separated from the other isomerisation products. Properties of this acid have been previously described by von Mikusch.

The differing behaviour of the two linoleic isomers has enabled a simple method to be developed for identifying dehydrated castor oil. For this the fatty acids (soluble in petroleum ether) obtained from the oil to be tested—or from an alkyd resin—were first freed from solid fatty acids by cooling to −40° C. in methanol solution. Of the remaining liquid acids, 2g. were topped up to a volume of 20 c.c. with a solution obtained by heating 20 g.NaOH with 100 c.c. diethylene glycol to about 205° C. This mixture was heated over the oil-bath at 200° C. for about 20 minutes, during which hydrogen or nitrogen was passed through it.

During the first five minutes required to reach the reaction temperature the mixture was stirred to obtain a homogeneous soap solution. The soap was acid-split in the usual manner and the fatty acids obtained were treated with petroleum ether, washed, and dried. A methanol solution of the fatty acids freed from petroleum ether under carbon dioxide or *in vacuo* formed on cooling to 40° C. crystals of 10,12-octadecadienic acid of about 20 per cent yield. This depends upon the presence of dehydrated castor oil in the original material.

Melting Point

After once recrystallising, a melting point of over 50° C. is usually observed, and in doubtful cases identity may be confirmed by determining the mix melting point with pure 10,12-acid. Another characteristic is the increase in the refractive index through isomerisation. Pure 10,12-octadecadienic acid had n d^{60} of 1.4692. Tests of various oils by this method gave the following results:

1. Commercial dehydrated castor oil, including samples obtained catalytically in the laboratory, the liquid fatty acids constituting about 96-98 per cent of total acids, showed an increase in refractive index—when isomerised—between 0.0034 and

0.0048, or 18-22 per cent. After once recrystallising the m.p. was between 49 and 53° C. Tests of the mix m.p. with purified 10,12- acid were in all cases positive.

2. In oils of high linoleic acid content, such as sesame, poppyseed, tobacco seed, maize germ and soya bean oils, the liquid fatty acids constituted from 55 to 85 per cent of total acids, and showed an increase in refractive index of 0.0053 to 0.009. In no case was a solid isomerisation product obtained on cooling in methanol solution.

3. Conjugated oils of commercial and laboratory types in most cases showed no increase in refractive index in the alkali treatment, but rather a slight decrease. The increase noted in one case was doubtless the result of incomplete conjugation of the commercial product. No solid isomerisation products were obtained in the given conditions.

4. Oils of high linolenic acid content, linseed oil, etc., showed a marked rise in refractive index. In some instances there was formed a small amount of solid isomerisation products which had a higher refractive index to the extent of 0.0150 units than the solid acids of ricinene oil, and could be easily identified as pseudo-elaeostearic acid. The triple-conjugated unsaturated acids from linolenic acid could therefore hardly be confused with the 10,12-octadecadienic acid.

5. Natural conjugated unsaturated oils, wood oil and one or two others, exhibit no rise in refractive index through isomerisation. They may be distinguished even in mixtures with other natural oils by the higher refractive index of the solid fatty acids separating out in the first stages (elaeostearic acid). Solid isomerisation products are not formed in the treatment of such oils or their mixtures with other natural oils.

6. Other oils, *i.e.*, castor oil, showed a slight decline in refractive index; tall oil fatty acids an increase; no solid isomerisation products were formed.

7. Ricinene oil in a mixture comprising 25 per cent dehydrated castor oil with linseed oil, yielded a positive result; a 10 per cent content could not be definitely detected.

In all these cases except the last this method furnishes a definite means of identifying oils, fatty acids, or alkyds of the varied commercial unsaturated types. A further supplementary test is needed to identify ricinene oil in mixtures.

Oil Mill Refining Wastes

Useful Aspects of French Research

MUCH interesting research in recent years has been directed to the study and utilisation of oil mill refinery wastes. M. Pierre Mérat, Secretary General of the ITERG (Inst. Tech. d'Etude et de Recherches des Corps Gras) has described some of this work, including that undertaken at his own Institute (*Oléagineux* 1950, *5* (7), 407-414).

Attention is given first mainly to the mucilaginous matter or phosphatides, particuarly lecithins, and the work of Desnuelle and collaborators at the ITERG, of which a detailed account has been published (*Ann. Nutrit. et Aliment'n.* 1949, *3* (3-4) 367-379).

It may be recalled that the phosphatides can be considered as triglycerides in which a fatty acid radical is replaced by phosphoric acid. In the lecithins the phosphoric acid is esterified by cholin; and in the cephalins it is re-esterified by colamine or hydroxyethylamine. The two series of derivatives are distinguished by their differences of solubility in alcohol.

The lecithins are recovered mainly by centrifuging—after flocculation and removal of the aqueous layer—and may be subsequently further treated with acetone for removal of glycerides, fatty acids and possible impurities.

M. Mérat says that in France the oil-milling industry is not yet properly equipped for the latter type of work, which greatly improves the organoleptic and keeping qualities of the lecithins. This is of greater importance now that they are being increasingly used in food technology.

The free fatty acid content of crude oils and fats varies within very wide limits, the maximum of about 60 per cent being found in palm oils produced by primitive native methods in W. Africa. The best known methods of removal are neutralising or saponifying with alkaline lye, and by superheated steam under reduced pressure. The soaps (soap-stock) formed by the first method may be sold to the soap-makers as such or split with sulphuric acid to recover the fatty acids. The product is very impure and still contains appreciable amounts of more or less neutral oil.

Steam treatment is often preferred,

though the alkali method with recent improvements is still largely used, *e.g.*, the Bamag-Vecker process. The industrial uses of fatty acids are many and varied and have been voluminously dealt with in the literature.

Colouring matters in oils and fats (carotenoids), except in palm oil, are generally eliminated in the process of bleaching and recovery is not usually considered worthwhile. In plants as a whole these carotenoids comprise lycopene and carotene. The former is responsible for the red colour of tomatoes and the hips and haws of English hedges; while the latter, isomeric with lycopene, has four homologues: alpha-, beta-, gamma-, and crypto-xanthine. The beta-carotene may be divided into two molecules of vitamin A, and the name provitamin A has been assigned to it.

Palm Oil Fractions

Some interesting work with palm oil has been carried out by the IRHO (Inst. de Recherches pour les Huiles et Oléagineaux) by M. Loury and co-workers (Value of palm oil as food, *Ann. Nutrit. et Aliment'n.*, 1949, *3*, (3,4) 451-458). They found that palm oil, after neutralisation, could be easily separated into two fractions. One fraction is solid and slightly coloured, consisting chiefly of saturated glycerides, and represents about two-thirds of the original oil. The other is liquid, consisting mainly of unsaturated glycerides and most of the colouring matter, and is usually known as red palm oil.

For recovery of carotene from the latter mixture the IRHO used two methods—distillation and saponification. In both cases the first step is the preparation of methyl esters; then (a) distilling under very high vacuum (1/10 mm. Hg.) at a temperature of 130-140° C., and recovering the carotenoids by chromatography; or (b) saponifying at a temperature of 60° C. or below in a nitrogen atmosphere, and treating the resulting dry soap mass with a solvent—petroleum ether, acetone, or chlorinated medium.

Method (b) is said to be a considerable improvement on those used hitherto. Saponification is limited to the coloured liquid part of the oil, and there is economy both of solvent and apparatus. The soaps form a useful by-product—sodium oleate with 25-30 per cent palmitate.

These carotene extracts should prove of great value in animal nutrition. They are odourless and tasteless and sufficiently stable, as they retain all the natural anti-oxidants of palm oil.

The sterols are characteristic constituents of all oils and fats, and usually form the greater part of the unsaponifiable portion; that of animal fats is mostly cholesterol, while the complex mixtures in plants are as phytosterols. Two of these have been definitely formulated, *e.g.*, sitosterol ($C_{22}H_{30}O$) and stigmasterol ($C_{48}H_{29}O$). The sterol content in oils varies widely: from 0.3-0.4 per cent in linseed or colza oils to 3.5 per cent in cottonseed oil, and over 7 per cent in some fish liver oils.

Sterols have become important sources of sex hormones, vitamin D, and other pharmaceutical products. The odorous substances in oils and fats removed in the superheated steam treatment often have a fairly high ketone content, *e.g.*, methyl-nonylketone. There is a possibility that these substances may be of value in perfumery. (See also paper by Jasperson & Jones (*J.S.C.I.* 1949).

In the second part of his work the author deals with oil-cakes and constituent products—proteins, lipids, glucids, mineral salts, and vitamins. The cake may be roughly classified as alimentary and industrial. To the former class belong the well-known cattle foods that have been fairly comprehensively dealt with in the literature. Recently they have formed the subject of a monograph compiled by the ITERG, which is, however, not for publication.

Valuable Protein

Increasing commercial use is being made of the cake, etc., obtained from pressing or solvent extraction methods (from solvent extraction the product is usually first in the form of meal). This cake is of doubtful value for cattle, and possibly toxic, but in a similar fashion to alimentary cakes it is used, for example, in the production of synthetic fibre (Ardil, etc.). The protein content is of major importance. It may be classified in two main categories: simple and conjugated. To the former belong the albumins, globulins, prolamines and glutelines; while the conjugated proteins are combined with other compounds such as carbohydrates, nucleic acids, etc.

Industrial applications may be divided into four groups, according to the extent of the change in the protein molecule: (a) very rare, in which the molecule size is unaltered; (b) chemical treatment to increase size of molecule; (c) partial degradation of the protein; and (d) complete hydrolysis into amino acids. Uses in production of adhesives, plastics, synthetic fibres (Ford Motors and I.C.I.), in the paper industry, and miscellaneous are briefly described. (25 refs.).

Technical Publications

DESIRABLE characteristics of the sensitive materials used, and recommendations on their handling and processing, are set out in "Photographic Aspects of the Radiography of Welded High Pressure Vessels," by L. Mullins. This reprint from "Welding Research" (Vol. 1, No. 4) is now available from the British Welding Research Association as a booklet (T.25) illustrated by 23 plates and diagrams.

* * *

INDUSTRIAL applications of the M-V tubular-sheathed heating element are described in an illustrated publication (No. 7703/1) recently issued by the Metropolitan-Vickers Electrical Co., Ltd., Manchester. A particularly interesting use is the emission of infra-red radiation. Other applications are in connection with convection heating, metal heating, cadmium and other plating baths, bitumen compounds, drying cabinets, pressure vessels and vacuum chambers.

* * *

THE rapid growth of chemical industry owes much to the process of welding and to the contractors who are producing a wide range of structures, vessels and equipment of varying metals to satisfy its requirements. Examples of the versatility of welding applications are given in a generously illustrated article in "The Welder" (Vol. 29, No. 104) published by Murex Welding Processes, Ltd. Among the plants described are those of the carbon black project carried out for Cabot Carbon, Ltd., Ellesmere Port, Cheshire, and the 130 ft. welded stack for Monsanto Chemicals, Ltd.

* * *

BIOS Survey No. 31 "Packaging in Germany during the period 1939-1945" (HMSO, 2s. 2d. post paid) surveys fields of German wartime packaging covered by reports previously issued (BIOS, etc.). Much of the information now collated is hidden in reports on other subjects, and there are comparatively few reports which deal with packaging as such.

There are notable gaps in the subjects included in the survey; no useful information has come to light on any type of wooden container. The survey contains nine sections covering: Paper, board, parchment, films and foils: metal containers; plastics; glass; textiles; adhesives and adhesive tapes; rot- and fire-proofing and corrosion prevention; food packaging; and filling machinery. Each has been prepared by an expert.

TETRA-ETHYL LEAD, the main stages in one manufacturing method and its applications are described in the current issue of "The Shell Magazine," (Vol. XXX), by K. F. Lindley, who also describes the early investigations of Thomas Midgley and Dr. Wilson.

* * *

A WIDE range of products, from bone meals and fertilisers to aluminium and non-ferrous castings, fire pumps, plastic moulds, pharmaceuticals, welding, etc., are listed in the third edition of the "Directory of Coventry." The book contains useful information about the city of Coventry, Government and public offices, trade inquiry offices, etc.

* * *

CREEP, one of the most interesting phenomena of the deformation of metals, is dealt with in a detailed and lavishly illustrated article which appears in the October issue of *Endeavour* (9, 36, 165 *et seq.*) The author is Professor E. N. da C. Andrade, director in the Royal Institution of Great Britain.

* * *

VIBRATION problems are the subject of special articles in the current issue of "Torque" (Vol. 1, No. 6), development journal of Silentbloc, Ltd., and the Andre Rubber Co., Ltd. Apparatus for record vibration tests in automobiles is described by Rolt Hammond, and in the first of a series of articles J. H. A. Crockett deals with industrial ground vibrations.

* * *

A COMPACT and precise instrument for the rapid routine measurement of fine suspensions and colour in liquids is being manufactured for Filtrators, Ltd., by the Edison Swan Electric Co., Ltd. The two companies collaborated in its design and development. The principle involved in the Filtrol photo-electric absorptiometer (governed by Beer's and Lambert's laws) is a precise measurement by photo-electric means of the light absorbed by liquids. The instrument, described in a leaflet just issued, can be connected to any 200-250 volt A.C. mains supply. Two identical glass cylinders of liquid, the reference and test samples are placed in the vertical tubes of the carrier and are in turn moved to a position between the light source and the photo-electric cell. Each tube can easily be moved to the correct position beneath the light source and measurement is facilitated by four interchangeable colour filters.

The Chemist's Bookshelf

NEW ATOMS. Otto Hahn. 1950. London, New York, Amsterdam and Brussels. Elsevier Publishing Co., Inc. Pp. 184. 12s. 6d.

Transmutation of the elements and atomic energy are topics about which little was written before 1945, and of the little there was practically nothing which the ordinary person could be expected fully to understand. Since 1945, however, there has been a spate of " popular " books on these and allied topics, the most recent of which fails to fulfil the promise implicit in the identity of the author. On the dust cover are posed certain questions, the implication being that the answers will be found in the text. The publishers' note asks: " How did Professor Hahn make the discovery, so potent for possible good and certain evil? Why did the Nazis make so little use of it? What are the elements we can now make, and what are their potentialities for the future? Why is the hydrogen bomb so much more disastrous a prospect than even Bikini could hold out?

Those questions, to which everyone would like to have Professor Hahn's answers, are in fact largely evaded by the ambiguities and obscurities of the text, which occasional misprints, grammatical errors and the like serve to heighten. This small and relatively expensive book, in fact, skates over the more burning aspects of the subject and is little better than a rather perfunctory summary of the work done in this field, together with a little of the fundamental theory underlying the " making " of new atoms.

It is also difficult to assess the amount of previous knowledge required for the comfortable reading of this book, which is supposed to be suitable for popular consumption. For example, on page 13 reactions involving γ-rays are mentioned several times, but the reader is not told what γ-rays are. A simple definition of such terms would seem to be essential in a work intended for the lay reader; failing that, a glossary should be appended. This book offers neither.

The last part of the book, which deals with Professor Hahn's reminiscences, is by far the best. It is most interesting and takes the reader " behind the scenes." For the remainder, greater care in presentation, clearer English and a less jerky style, would have considerably improved the work, and perhaps made it worthy of so distinguished a scientist as Professor Hahn.—P.M.

Books Received

GERMAN - ENGLISH DICTIONARY FOR CHEMISTS. A. M. Patterson. 1950: New York, John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. xviii + 541. 40s.

TITANIUM. Jelks Barkdale. 1949: New York, The Ronald Press Company. Pp. xii + 591. $10.

STRUCTURAL CHEMISTRY OF INORGANIC COMPOUNDS, Volume 1. W. Hückel. 1950, London, Amsterdam and New York: Elsevier Publishing Co., Ltd. Pp. xi + 437. 70s.

SELENIUM. S. F. Trelease and O. A. Beath. 1949, New York. Published by the authors. Pp. vii + 292.

UNFAMILIAR OXIDATION STATES AND THEIR STABILISATION. J. Kleinburg. April, 1950: University of Kansas Press. Pp. 131. $3.

British Instruments Exhibition

A REPRESENTATIVE display of British scientific instruments will be made in London next year—from July 4-14. The British Instrument Industries' Exhibition is expected to bring together nearly all types of industrial and scientific instruments, and considerable support has already been evidenced by the applications for space received from trade associations and their member firms. These include the Scientific Instrument Manufacturers' Association, British Industrial Measuring and Control Apparatus Manufacturers' Association, British Electrical and Allied Manufacturers' Association, Drawing Office Material Manufacturers' and Dealers' Association, British Lampblown Scientific Glassware Manufacturers' Association and the Department of Scientific and Industrial Research.

OVERSEAS CHEMISTRY AND INDUSTRY

ADVANCED ENGINEERING IN HUNGARY

Current Work on Special Autoclaves

THE contrast represented by the comparatively advanced stage of technology in territories which before the war were among the " industrially backward " countries is underlined in current news of industrial development in Hungary.

The Lampart Company has for a considerable time been specialising in the manufacture of enamelled, acid-resistant apparatus, mainly for the chemical industry. The synthesis of organic chemicals is now calling for much special equipment for the new techniques.

An account contributed by Péter Farkas to *Hungarian Heavy Industries* (No. 3) throws interesting light on the degree of development of chemical plant designing and construction in post-war Hungary. The author is chief engineer of the Lampart Works. He gives several examples of the kind of problems dealt with.

So far, the majority of experiments have been carried on in special laboratory glass apparatus. By employing greater pressures and higher temperatures, the chemist can prepare his compounds more quickly and, more important, by using these techniques can open up the road to new achievements.

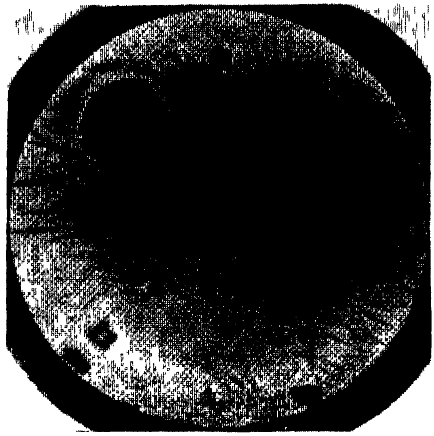
Glass Apparatus Unsuitable

Chemical reactions under higher pressures and greater heat than previously used will yield a great number of useful compounds. For these tasks, however. glass apparatus was no longer suitable and special equipment was required. Research to develop new types of chemical apparatus has been carried on by the I.G.F. and Andreas Hofer in Germany, and also in the U.S.A.

As a result of widespread experiments several types of workable high-pressure autoclaves have been developed which meet the requirements of the chemical industry. The basic problems having been solved, new designs have only to cope with the special demands of individual processes.

The Lampart Works received requests from various Hungarian research laboratories for the designing of high-pressure autoclaves, and, after more research, began to produce special autoclaves.

Autoclaves are chosen for the kind of chemical reactions intended for observation. The reactions between solid, liquid and gaseous materials are of different kinds and it is at the chemist's discretion to select the apparatus which will best suit his purposes. When the methods have not yet been worked out and experiments are necessary, small-sized, high-pressure bombs are recommended as the most suitable for deciding upon the principles of procedure.



Effect of pressure on autoclave

These bombs are made with a maximum capacity of 50 cu. cm. for highest pressures of 500 atm. and a temperature limit of 500° C. They are made of material which is heat and acid resistant stainless steel. Smaller bombs are made only with pyrometers, larger ones can also be equipped with manometers and valves. They are heated with gas flame, oil- or salt-bath. To avoid eventual over-pressure, account should be taken of the superheated steam pressure, which can be calculated easily from the heat value, or the course of the chemical reaction has to be assessed in advance.

In experimenting with the bomb all calculations were checked by exposing the various parts to very high pressures. The result of one of these experiments is shown in the photograph above.

A 500 c.c. capacity pure nickel autoclave was exposed to 150 atm. pressure and 300° C. heat and in the hollow space of the cover stuffing box a pressure of 10,000 kg/sq. cm. was created. The picture shows the effects of this excessive pressure upon the metal. No explosion took place,

only radial cracks developed—along the crystalline boundaries.

This excessive pressure—brought about on a hydraulic press by means of a plastic medium—has proved that the apparatus was constructed with an ample safety margin. Moreover, the carefully selected materials do not explode but instead develop minute cracks through which the pressure discharges. With normal use, the apparatus offers a 100 per cent service safety with the additional assurance that occasional excesses of pressure can be periodically withstood.

Autoclaves are destined generally for slow reactions. As a rule, the useful charge must not be more than two-thirds of the entire capacity. Standing autoclaves are used when there is no need for keeping liquids in motion, but for mixing of gases with liquids, as well as for mixing of difficultly miscible liquids, shaking autoclaves are installed. These types are also used for carrying out tasks in which oxygen is involved.

Shaking autoclaves can be employed for hydrating and here a permanent gas supply is maintained by means of a capillary. Autoclaves with agitators, both vertical and horizontal types, are used when the reactor has later to be carried out on a factory scale. The choice between them depends on which affords the best means of accelerating the reaction. When a large surface contact between the gas and liquid is required, the horizontal type is chosen; whereas if the gas is required to pass continuously through the liquid in the presence of a catalyst, the vertical type is used.

As an example of the use of specially designed autoclaves the case of a prominent Hungarian pharmaceutical factory is mentioned. The factory set up a programme to develop an anti-TB compound, but the chemists were unable to put their ideas into effect for want of suitable equipment. After the research chemists had heard about the capacities of the Lampart apparatus the factory was commissioned to begin constructing the new autoclave without delay. After six weeks the work was successfully completed and the autoclave was delivered. It was an agitator type with a special heatkeeping, dry stuffing box suitable for the special requirements.

Thus, equipped with the new autoclave, the research staff of the pharmaceutical factory put their ideas to test, and, as their findings were confirmed, the manufacturing process of the new drug was developed.

Current Research and Production in India

THE National Metallurgical Laboratory of India, which is being built at Jamshedpur, is nearing completion and is expected to be formally opened on November 16 by the Prime Minister, Pandit Nehru. The new laboratory is one in the chain of 11 National Laboratories being set up by the Government of India at different places in the country. Seven of these will be ready this year, including the Central Food Technological Research Laboratory in Mysore, which will be opened on October 21, and the Central Drug Research Institute of Lucknow, which will also operate before the end of this year. The remaining four will be opened during 1951.

Arrangements are being made for the manufacture in India of Antigen, required for the treatment of venereal diseases. Announcing this, Mr. T. G. Davies, Chief of Mission (India, Afghanistan and Ceylon) of the United Nations International Children's Emergency Fund, said that production would be started with the help of the World Health Organisation. The "know how" will also be made available to India.

The Government of India is to conduct a survey of the scope for the growing of pyrethrum in the Nilgris and the Palni hills in Madras State, and in Kashmir and Assam. The Madras Government is likely to employ Government of India officers to conduct the survey. During the last war 1800 acres of pyrethrum was grown on the Nilgris and about 600 acres on the Palnis. It was also grown in Kashmir and to a small extent in Assam. After the war the demand for pyrethrum fell and its cultivation was restricted. Now the yield in Madras State is utilised for making pyrethrin for use in the Forest Department and in Government offices. The prospect gains encouragement from the restriction of the use of DDT for some purposes in the U.S.A. Pyrethrum has virtually no toxic effect on human and cattle life.

Kenya, the chief supplier, is unable to meet the whole of the current demand. In 1944 a total of 34.5 tons of dry flowers was collected in the Nilgris and in the Palnis, and 97.9 tons in 1945. In 1946 there was a sharp reduction, only 21 tons being collected.

PLASTICS IN WESTERN GERMANY

Overall Shortage of Raw Materials

ALTHOUGH world economic conditions and, in particular, the international situation, have during the past few months led to an increased demand for plastic products, Germany, because of the lack of certain raw materials, has been unable to take full advantage of this rising demand.

Among the reasons for this given by Dipl. Ing. H. Tschlacher, director of the Plastics Trade Association (*Chem. Industrie,* 1950, *2* (10), 495-9) is the current shortage of phenol, for which the demand in Germany has approximately doubled since the end of 1949. This demand has outweighed production from tar distillation although this increased from 1970 tons in 1949 to 6600 tons this year, and has also outstripped production from synthesis methods (now 12,000 tons per annum). The latter are hampered by a scarcity of benzol.

Benzol output in W. Germany is now about 22,000 tons per month, 10 per cent higher than in 1949, but still 20 per cent below the pre-war output. The demand for benzol as a fuel, which is now about 250,000 tons a year, leaves only 14,000 tons for other industries, including plastics.

The importation of benzol and phenol is practically impossible especially from the U.S.A., where benzol is the main raw material for styrol and thus for Buna-S.

Better Styrene Supplies

Phenol-cresol mixtures may, however, ease the benzol scarcity in Germany. The supply of styrene is little better. Total capacity of East and West Germany was originally limited by the Allied authorities to 20,000 tons but the Russians seem to have waived this rule, and the 20,000 ton limit now applies only to W. Germany. Yet present production of styrene and polystyrene is insufficient, and contracts for supplies from America have had to be cancelled because of long-term delivery dates —up to 18 months. The position would be worsened if Buna manufacture should be resumed to any appreciable extent in W. Germany, although at present this seems unlikely. Polyvinylchloride is also increasingly in demand, *e.g.*, by rubber interests. Productive capacity in Germany, however, has suffered seriously from demolitions and is at present only 1200 tons of PVC per month in West Germany, while the demand would require at least 1800-2000 tons. A certain amount has to be exported.

The important material, polyethylene, is in growing demand, particularly for electrical and chemical engineering. A relatively new field for this thermoplastic is the manufacture of acid containers—for which there is said to be a large future. Within the next few years demand for polyethylene in West Germany is likely to be approximately 10,000 tons per annum. Thus, it is not surprising that the prices of raw materials for plastics industries have soared. This applies not only to those already mentioned but also to casein, linters and other cellulose products, linseed oil, etc.

The author does not think the position is likely to improve in the near future. He especially mentions the import of linseed oil from Brazil and Uruguay to the value of $17.5 million and says that this shows the marked tendency for prices to increase.

Manufactured Products

In the same issue of *Chemische Industrie* is an article by Dr. G. Suhle, director of the GKV (Gesamtverband Kunststoffverarbeitende Ind.), who describes the present general position of the manufactured plastics industry. A rough estimate of the number of firms engaged directly or indirectly in the various branches of the industry is 7500 to 8000 in West Germany, but only about 1200 of these are wholly engaged in genuine plastics manufacture. These firms employ about 29,000 persons, of whom nearly 5000 are employers, directors, or managers. Without increasing works or plant capacity the number could be raised to 40,000 by introducing shift working on a larger scale. The limit is not demand, for in the export field at least, this is increasing, but is instead the raw materials scarcity already mentioned.

West German production returns are not available, but for the British section, which represents 60 per cent of the total, the monthly output in 1949 averaged 1750 tons. This rose during the first half of 1950 to 1800-2000 tons per month, and shows a fairly uniform rate of increase from January, 1947 (328.7 tons). The estimated production in all West Germany at present is 3765 tons per month, with a value of Dm.24.9 million. This presumably refers to manufactured plastic products, in which moulded products (pressmasse)

(continued at foot of next page)

Rising Cost of South African Chemicals

Reported Difficulties of Using Industries

SOUTH AFRICA is experiencing an acute shortage of some industrial chemicals. This has been attributed largely to the effects of the Korean War and of rearmament schemes. Chemicals imported from the Far East, particularly, are coming in more slowly and have risen considerably in price. Prices of several chemicals from the United States and Britain have also risen and deliveries are falling far short of the Union's demands. One cause of the scarcity of imported industrial chemicals is the world shortage of steel, tinplate and tin, which are necessary for containers. Substitutes have not yet been found. The shortage of raw rubber is already being felt seriously in local industries. Its price has risen 300 per cent in a short period. There is an extreme shortage of essential oils, among them citronella and lemon grass oils. The price of pine oil from the United States has risen by more than 100 per cent. The rising cost of linseed oil is also presenting serious problems to the paint industry. Farming costs are being affected by the shortage and increased prices of chemicals for pest control. The Union is now importing from Kenya much of the pyrethrum needed, but the prices of the raw material has also risen between 30 and 40 per cent.

* * *

A SERIOUS scarcity of salt in South Africa is foreseen by the chairman of the Northern Cape Chamber of Salt Producers. The scarcity has been made worse by the abnormally heavy August rains in the Northern Cape, which produces about 70 per cent of the Union's salt. Some orders for the tanning, soap, wood pulp and livestock feed industries have not been supplied. Salt production would normally have started some weeks ago. Production in the Orange Free State has also been checked by rain. It is not thought that there will be a serious scarcity of table salt, of which there are fair reserve stocks.

* * *

OIL company chiefs in Cape Town, with one exception, have said they know nothing of reported schemes by overseas oil companies to establish refineries in the Union. One, a director of the Vacuum Oil Co. of S.A., Ltd., did not deny knowledge of such a scheme, but had no comment to make. It is thought in some quarters that the Vacuum Oil Co. may have decided to proceed with a shelved £12.5 million scheme to establish a big oil refinery at Durban which would be able to supply South Africa with about one-third of its petrol requirements. The Vacuum Oil scheme for Durban proposed the erection of a refinery on the Bluff industrial area and a pipeline linking it with the Durban oil wharves. The crude oil would have been shipped from the Persian Gulf or, if that source had been cut off, from Indonesia or Alaska. The project was shelved after the failure of negotiations between Mr. C. K. Gamble, then vice-president of the Standard Vacuum Oil Co., and the Union Government. They concerned concessions, including reduced railway charges for petrol.

* * *

VERY little bark is at present being stripped in the Natal wattle-growing districts and most growers are engaged in clearing and, in some instances, are extending their plantations. Growers aim at completing these operations before the start of the summer rains when stripping will again be undertaken.

PLASTICS INDUSTRY IN WESTERN GERMANY

(continued from previous page)

predominate and synthetic resins play a relatively small part.

Total products made by the spray-cast (Spritzguss) method have now passed the monthly target of 400 tons, and the figures are likely to increase rapidly in proportion to the availability of polystyrene and polyethylene. The process offers many possibilities, the products taking the place of glass and other ceramics and also finding use in refrigerating equipment and in household utensils. Only a small rise in purchasing power is needed in Germany for this section of the plastics industry to find a large and increasing market. Attempts, however, to introduce this class of plastic into the electrical industries have so far only met with partial success.

On the other hand the polyvinylchloride plastics have shown marked progress during the past eighteen months, especially in the textile, rubber and leather industries. It is considered that export prospects are good.

· OVERSEAS ·

Cortisone Price Lowered

Merck & Co., New York, has recently reduced the selling price of cortisone from $95 to 50$ per gm.

International Chemical Congress

An international analytical and experimental chemistry congress is to be held in Paris from November 20-24 under the auspices of the Société de Chimie Industrielle, 28 rue St. Dominique, Paris 7e.

More Power for Canadian Aluminium

The Quebec Government has recently approved plans by the Aluminium Company of Canada for expenditure of $30 million on the initial development of a 60,000 h.p. hydro-electric plant on the Peribonka River in Lake St. John district.

U.S. Crude Oil Production

Daily output of crude oil in the U.S.A. for the week ended September 30 was 5.835 million barrels, according to the American Petroleum Institute. This compared with 5.826 million barrels in the preceding week and 4.95 million barrels in the corresponding week of last year.

Uranium Ore Discovered in Canada

Discovery of a new source of uranium ore at North Shore Lake, Athabasca, Saskatchewan, was reported last week in the *Montreal Star*. Uranium oxide content of the ore is claimed to be as high as 40 per cent. The new field is of exceptional dimensions, covering 30 miles by 15 miles.

Finnish Nickel Deposits

Deposits of nickel ore are reported to have been discovered near Harjunpää village, north of Björneborg, Finland, which are considered to be more important than the occurrences at Petsamo which are now being exploited by the U.S.S.R. The ore is stated to contain 1.5 per cent nickel, 1 per cent copper, and traces of gold and platinum.

Industrial Formaldehyde Solutions

Solutions of formaldehyde in various types of alcohols are being made generally available for the first time by the chemical division of Celanese Corporation of America. The new products, being produced in a pilot plant at Bishop, Texas, is being sold as 55 per cent solutions of formaldehyde in methanol and 40 per cent solutions in butanol, propanol and methanol.

French Beryllium Deposits

Important occurrences of beryllium are reported to have been found in the commune of Bessines, Haute-Vienne, France.

Sulphur Deposits in Iraq

Deposits of sulphur are reported to have been discovered recently near Sulaimaniyah in Iraq. Three small deposits were discovered in 1947 in the neighbourhood of Basra and there are also occurrences near Kifri and Fata.

U.S. Cerium Deposits

The Molybdenum Corporation of America is at present sinking a shaft into the deposit of the fluocarbonate mineral, bastnäsite, 6[(La, Co) FCO_3], which was discovered in California during 1949. It is hoped that the deposits will be sufficiently abundant eventually to make the U.S. independent of foreign sources of cerium and lanthanum.

Sharp Increase in Norwegian Chemicals

In the first eight months of this year industrial progress in Norway in terms of physical output showed an overall increase of 7 per cent over the corresponding period last year. Progress in the export industries has been particularly marked—16 per cent greater than last year. Among individual industries, the chemical industry showed the greatest progress with a production index figure of 157 (1938 = 100).

U.S. Aluminium and Zinc Quotas

Quotas for the export of aluminium and zinc for the last quarter of this year were established by the U.S. Government on October 9. The Commerce Department has provided for 7000 tons of aluminium and its products and 6500 of zinc and products. Earlier intentions to put a quota limitation on lead and its products for the fourth quota have not been carried out.

British Radar Installation for Norway

An expedition sent by the Norwegian Polar Institute has this summer installed Norway's first shore radar station, and what is probably one of the northernmost radar installations in the world, at Cape Linne in Spitsbergen. The station is expected to be of great assistance to vessels entering Ice Fjord on their way to Longyear City, the Norwegian mining settlement. The radar set is British, and a British expert helped to install and demonstrate it.

PERSONAL

THE Institution of Works Managers announces the election of the following officers for 1950-1:—Vice-presidents: SIR MONTAGUE BURTON, chairman of Montague Burton and Sons, Ltd., and MR. A. G. RAMSEY, chief engineer to the Ministry of Works. MR. J. CONNELL, manager of the Izal factory of Newton Chambers and Co., Ltd., becomes chairman in place of MR. A. P. YOUNG, who retires from the office which he has held for 16 years. MR. C. N. POTTER, works manager to Ilford, Ltd., has been elected deputy chairman in place of MR. J. CONNELL. MR. J. M. WEIR, formerly works manager, I.C.I. Dyestuffs Division, becomes hon. treasurer in place of MR. R. G. BERCHEM, managing director of Jeyes' Sanitary Compounds Co., Ltd.

The Mineralogical Society has announced that the following officers will be elected at the anniversary meeting of the society to be held on November 2. President: PROFESSOR C. E. TILLEY; vice-presidents: DR. A. F. HALLIMOND and DR. S. J. SHAND; treasurer: MR. E. H. BEARD; general secretary: DR. G. F. CLARINGBULL; foreign secretary and editor of the journal: DR. L. J. SPENCER.

The Pharmaceutical Society has awarded the Pereira silver medal to MR. NORMAN DAVID HARRIS, Clapham Common, London, S.W.4, who achieved distinction in this year's pharmaceutical chemist qualifying examination. Mr. Harris was awarded the B. Pharm. degree of the University of London in July.

MR. EDRYD JONES, Machynlleth, a graduate of Aberystwyth College, has been appointed soils chemist at Trawscoed, Cardiganshire, the Welsh headquarters of the National Agricultural Advisory Service.

MR. L. H. A. PILKINGTON, technical director of Pilkington Brothers, Ltd., was the speaker (on "Flat Glass") to the Midland Section of the Society of Glass Technology at Stourbridge recently. SIR GRAHAM CUNNINGHAM, chairman of the Triplex Safety Glass Co., Ltd., presided.

PROFESSOR J. W. COOK, F.R.S., Regius Professor of Chemistry in the University of Glasgow, has consented to serve on the University Grants Committee until December 31, 1954.

MR. R. E. WINTER has been appointed manager of the fan department of Air Control Installations, Ltd., as from October 1, in place of MR. W. LEE, who has left the company

PHYSICISTS ELECTED

THE Institute of Physics announced the election, on October 12, of six new Fellows and 47 associates. The new Fellows are:—

J. M. BUIST (Manchester), J. A. CLEGG (Manchester), S. M. COX (Sunderland), E. H. JONES (Stockport), M. P. LORD (London), G. E. ROTH (New Zealand).

The new associates are these:

N. ADAMS (Manchester), S. Z. ALI (India), D. BARBER (Malvern, Worcs.), I. J. BEECHING (Gotham, Notts.), P. BOMYER (Coventry), H. BUCKLE (Manchester), R. K. CAMPBELL (Edinburgh), J. A. CHALDECOTT (London), A. CHARNLEY (Manchester), T. CHARNLEY (Manchester), R. W. CROMPTON (Australia), A. M. DOBSON (Wallham Cross), G. W. DOLPHIN (Reading), J. K. DONOGHUE (Widnes, Lancs.), P. E. DOUGLAS (Ilminster, Som.), W. G. ELFORD (Australia), C. R. EVANS (Manchester), E. G. GAMBLE (Cambridge), F. A. GLOVER (Reading), F. A. GREENWOOD (Rossendale), G. W. HAMSTEAD (Barnet, Herts.), P. F. HANSON (Luton, Beds.), P. HARIHARAN (India), M. V. M. HERCHENRODER (Mauritius), D. C. HOOKWAY (Birmingham), R. M. HORSLEY (Leeds), V. C. HOWARD (Chilwell, Notts.), P. M. JEFFERY (Australia), E. KAY (Farnborough), P. D. LOMER (Cornwall), A. L. MACKAY (London), L. MANDEL (London), L. E. MUSSELL (Sherwood, Notts.), H. NARAIN (Australia), A. C. NICOLLS (London), D. J. OLIVER (Sheffield), D. J. PACEY (London), D. W. PASHLEY (London), F. A. ROBERSTON (Lydd, Kent), H. ROLFE (Llanelly, Wales), R. SCOTT (Stoke-on-Trent), G. STEPHENSON (London), D. J. SUTTON (Australia), T. C. TOYE (Swansea), D. H. TREVENA (Talybont, Cards.), G. C. WILLIAMS (Grovesend, Glam.), J. C. WILLIAMS (Sunderland).

Neglected Plant Sources

MANY plants were growing wild in Ireland which could be cultivated for their medicinal properties, said Mr. Christopher O'Connor, M.P.S.I., in a paper read before the Pharmaceutical Society of Ireland in Dublin on October 9. Aconite, agramony, foxglove, lavender, marsh mallow, valerian, yarrow, spagnum moss were indigenous examples, and non-indigenous plants would probably grow if introduced, he added. (Bella donna is already being cultivated in the Republic.)

Obituary

THE death is announced, at the age of 60, of Professor William Rearden Atkin, who occupied the Chair of Leather Industries at Leeds University, to which he succeeded in October last year on the retirement of Professor Douglas McCandlish. In 1912, at the age of 22, he was appointed to the Leeds University staff as research assistant to Professor H. R. Procter, then head of the leather industries department there. Professor Atkin held a lectureship in leather trades chemistry continuously until his appointment as principal. He was a past president of the International Society of Leather Trades' Chemists and hon. editor of its journal for a number of years.

HOME

Copper Price Change

The Ministry of Supply announces that from October 18 its buying price for rough copper in slabs of from 2-3 cwt. is raised from £156 to £170 per ton.

Wolfram Prices Reduced

The price of wolfram has been reduced twice within a week, on each occasion by 5s. Prices quoted on Octeber 12, after the second reduction, were within the range of 235-245s. per unit.

Dearer Antimony

Prices of antimony were increased on October 16. The 99.6 per cent and 99 per cent metal were each raised by £20 to £235 and £225 a ton, respectively. Crude 70 per cent metal was raised by £15 from £165 to £180 a ton.

Record Tin Prices

Prices of tin touched new records during the week, but later remained steady. Settlement on the London Metal Exchange at the closing session on October 10 was £860. The price continued to rise on the two following days, reaching £885 for settlement on October 12. There was a moderate setback to £875 (settlement October 13) while the price remained steady on October 16 at £877 cash settlement.

Change of Address

On October 16 the address of the Association of British Pharmaceutical Industry became Tavistock House *South*, Tavistock Square, London, W.C.1. The telephone number, EUSton 2531/2, remains unchanged.

Export Control of Sulphur Materials

Export licences are now required for spent oxide, sulphur and certain sulphur mixtures, molybdenum and nickel in specified forms and alloys containing cobalt, molybdenum and nickel. This was notified by the Board of Trade in the Export of Goods (Control) (Amendment No. 6) Order, 1950, which came into effect on October 18.

Coal Production

Coinciding with the end of the miners' holiday season, last week's total production of coal increased by 43,500 tons over the previous week. Comparative figures are:—Last week: 4,329,500 tons (deep-mined 4,087,000 tons, opencast 242,500 tons). Previous week: 4,286,000 tons (deep-mined 4,069,200 tons, opencast 216,800 tons).

KID Exemption

The Treasury has exempted anisaldehyde and diphenylamine from Key Industry Duty from October 16 to December 31, 1950.

London Exhibition

THE CHEMICAL AGE and associated publications will be represented at the Dairy Show and Ice Cream Exhibition, Olympia, London, October 24-27.

Pharmacognosy Recognition Sets

Evans Medical Supplies, Ltd., draw the attention of students to the availability of their sets of crude drugs. Full details will be sent on request to the publicity manager, Speke, Liverpool 19.

Increased Cost of Whale Oil

The increased cost of whale oil is reflected in the Norwegian whaling companies' sale of 80,000 tons of whale oil to the Ministry of Food, at £100 a ton. This compares with 50,000 tons at £80 a ton sold to the M.O.F. by Norway in 1949.

Profit Sharing

Bonuses amounting to 6 per cent of their year's wages have been distributed under the firm's new profit-sharing scheme to employees of Quickfit and Quartz, Ltd., Stone, Staffs. The company is also establishing a pension fund and life assurance scheme for employees.

Salt Merger Proposed

The amalgamation of the Cheshire United Salt Co. with Palmer Mann and Co., which manages and acts as its selling organisation, is under consideration. The Cheshire United Salt Co., it is stated, is in a position to acquire the entire issued share capital of Palmer Mann and Co. for £275,000 (allowing for the costs of purchase and raising the requisite cash, for an estimated total of about £294,000).

Bid to Revive Coal Distillation Scheme

The Scottish Area of the National Union of Mineworkers is protesting against the decision of the Lanarkshire County Council not to attend the coal distillation conference which the union is organising at Hamilton, Lanarkshire, on October 29. The conference is intended to discuss ways of securing coal distillation plants in Lanarkshire, so that the coal measures there, considered uneconomic, should not be abandoned. All authoritative reports in the past on the distillation project have been adverse.

The Stock and Chemical Markets

INDUSTRIAL share dealings have presented a somewhat confused picture, produced by the widespread uncertainty regarding future economic conditions. The market as a whole, however, has remained active and was stimulated by the further rise in British funds. This, exemplified by the quotation of 97¼ for 3½ War Loan, is associated with the economic improvements which have given rise to rumours of approaching revaluation of sterling. There is, of course, no authority for the assumption that an upward revaluation will take place in the near future.

In addition to the belief that higher taxation is inevitable next year, it is feared that the present sharp uptrend in materials prices must be affecting company earnings, and that the rearmament programme must increase inflationary trends.

Imperial Chemical fluctuated and have eased to 41s. 9. at the time of writing. Monsanto were firmer at 51s. 3d., Albright & Wilson were 29s. 9d., Brotherton 10s. shares 20s. 3d., Boake Roberts 5s. shares 31s. 6d. and Fisons have been more active around 27s. In other directions, Amber Chemical 2s. shares were 2s. 9d.. F. W. Berk shares 11s. 6d., Bowman Chemical 5s. 3d., Pest Control 7s. 4½d. and Woolley 4¾ per cent debentures 104½. W. J. Bush ordinary were 85s. 6d. and the 5 per cent preference 22s. 9d. Laporte Chemicals 5s. shares were more active around 10s. 4½d.

British Oxygen rallied to 92s. 6d., British Aluminium were firm at 44s. 9d., the 4s. units of the Distillers Co. 19s. 6d., but United Molasses eased slightly to 46s. 3d. Turner & Newall, at 84s., reflected market hopes that a higher dividend is in prospect. The 4s. units of British Glues & Chemicals eased to 20s. 9d., United Glass Bottle at 76s. 3d. were firm again, and Triplex Glass 10s. shares showed activity around 27s. 3d. British Xylonite were 83s. 9d., Kleeman 1s. shares 10s. 4½d. and British Industrial Plastics 2s. shares 6s. 1½d., Glaxo Laboratories were still active, and at 51s. 3d. regained an earlier small decline.

The big success of the debenture issue, with a premium of 28s. 9d. over the issue price, helped Lever & Unilever shares up to 44s. There is also talk of higher dividend prospects if the Dutch Lever N.V. pays more. There is a dividend equalisation agreement between the two companies.

Only a moderate business has been done in iron and steel shares and those of companies on the nationalisation list remained virtually unchanged and well below their scheduled take-over levels. Selling by holders who do not wish to exchange into the nationalisation steel stock has evidently continued. Prices are expected to move nearer the take-over levels before next February. United Steel, at 29s. 3d., have made very little response to the company's good results, the reflection of record output, but the dividend is limited to an unchanged 8 per cent by the Steel Act. Elsewhere, Staveley after improving, eased to 85s. 3d. Courtaulds were up to 39s. 6d. on the higher prices for rayon yarn, while British Celanese continued active up to 25s. in anticipation of the financial results and on talk of a higher dividend and a coming new issue. Oil shares were uncertain, Anglo-Iranian around £6⅝, Shell 65s. and Mexican Eagle, at 22s. 7½d., reflected profit-taking following the capital repayment news. Ultramar Oil were firmer at 17s. 10½d. in view of the improvement represented by the repayment of part of the loan from the Finance Corporation for Industry.

Market Reports

MOST sections of the industrial chemicals market have been active during the past week, with home buyers calling for spot parcels. Delivery specifications against contracts have continued up to schedule. Export inquiry has been well maintained and reports indicate an increasing volume of chemicals for U.S.A. and Canada. In many cases overseas requirements are difficult to meet because of the shortage of drums. Apart from the recent increase in the prices of copper sulphate and imported white arsenic, there have been no outstanding price changes for industrial chemicals; quotations are firm throughout the market. The call for non-ferrous metal compounds remains strong and a brisk routine demand is reported for most of the soda products and also potash chemicals. The coal tar products market shows little change from the strong conditions of last week. The supply position generally is not difficult and offers are finding a ready outlet. The demand for ADF cresylic acid is well maintained.

MANCHESTER.—New business on home and export account in heavy chemical products on the Manchester market during the

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BALDWIN CHEMICAL SALES, LTD., Harlow. (M. 21/10/50). August 15, £4000 debentures; general charge.

BOWMANS CHEMICALS, LTD. (formerly BOWMANS (WARRINGTON), LTD., Widnes. (M. 21/10/50). September 14, mortgage and charge to National Provincial Bank, Ltd. charged on land and buildings at Widnes and Warrington, with plant, fixtures, etc., also a general charge. *Nil. January 24, 1950.

TILTMAN LANGLEY LABORATORIES, LTD., London, W. (M. 21/10/50). September 20, debenture to Barclays Bank, Ltd., general charge. *Nil. December 8, 1949.

WELINCOM, LTD. (formerly WELDED INDUSTRIAL COMPONENTS, LTD.), London, E.C. (M. 21/10/50). September 18, charge to Barclays Bank. Ltd., charged on 15 McKinley Road. Bournemouth. *Nil. December 31, 1947.

Satisfaction

YEOVIL DEGREASING CO., LTD., London, E.C. (M.S., 21/10/50). Satisfaction September 22, debentures registered November 19, 1948, to the extent of £5000.

Company News

Albright & Wilson, Ltd.

The directors of Albright & Wilson. Ltd., state that the recent issue of 2.023,164 5 per cent cumulative preference shares of £1 at par has been largely oversubscribed, the "rights" offer having accounted for more than 99 per cent.

Stream-Line Filters, Ltd.

Trading profit for 1949 was £42,272 (£24,442). After providing for taxation, £17,704 (£8700), and charges, there remains £9647. The dividend for year is maintained at 12 per cent.

Change of Name

An extraordinary general meeting of shareholders of the Péchiney group has decided to change its name from Alain, Froges et Camargue to Péchiney, Compagnie des Produits Chimiques et Electrométallurgiques. The nominal value of the shares was increased from Fr. 625 to Fr. 2500.

Increases of Capital

The capital of the James B. Williams Co. (England), Ltd., has been increased by £49,900 beyond the registered capital of £100.

The capital of the Frome Chemical Company, Ltd., has been increased from £2000 to £5000.

New Registrations

Astell Laboratory Service Co., Ltd.

Private company. (486,031). Capital £2000. Suppliers of bacteriological culture media, glassware and apparatus. Director: J. R. Cuttell. Reg. office: 172 Brownhill Road, S.E.6.

W. B. Cole (Chemists), Ltd.

Private company. (486,188). Capital £1000. Manufacturing, pharmaceutical and general chemists, etc. Directors: Clara J. Cole, Claire J. Cole and J. E. Hutt. Reg. office: Swan Street, Sible Hedingham, Essex.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

past week has been on a fair scale. There have also been a number of requests for delivery of outstanding orders. Substantial quantities of alkalis and other products are being taken up by the cotton and woollen industries, and there is a ready outlet elsewhere. There was a firm undertone to prices in nearly all sections of the market. In fertilisers, a steady trade was carried on in basic slag and its compounds. Light and heavy tar products were in good demand.

GLASGOW.—The Scottish heavy chemical market has been fairly busy over the past week and orders have been plentiful. Prices continue to rise, some of the items which have shown an increase being due to the increased cost of paper bags. Overseas business is slackening, principally owing to the fact that many chemicals are no longer available for export.

Next Week's Events

MONDAY, OCTOBER 23

Institution of the Rubber Industry

Manchester: The Engineers' Club, Albert Square, 6.15 p.m. "Engineering in the Rubber Industry" by E. Morris, M.I.Mech.E.

Institution of Electrical Engineers

Newcastle upon Tyne: Neville Hall, Westgate Road, 6.15 p.m. "Some Notes on Electrical Installations in Large Chemical Factories" by D. B. Hogg, M.B.E.

TUESDAY, OCTOBER 24

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 5.30 p.m. "Flow Pattern in Furnaces" and film, "Film Flow" by Dr. J. H. Chesters.

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m. "The Preparation and Publishing of a Scientific Paper" by Dr. H. R. Lang.

WEDNESDAY, OCTOBER 25

Institute of Physics

London: The Polytechnic, Regent Street, W.1, 3 p.m. "Technical Universities" by Lord Eustace Percy.

Institute of Chemistry of Ireland

Dublin: Trinity College, 7.45 p.m. "Editing for the Chemical Society" by R. S. Cahn, M.A.

British Association of Chemists

London: Wellcome Research Institute, 183 Euston Road, N.W.1, 7 p.m. "Research Aspects of Polyvinyl Chloride Plastics" by C. E. Hollis, F.R.I.C.

Chemical Society

Glasgow: Royal Technical College, George Street, 7 p.m. "Recent Developments in Macrocyclic Pigments" by Professor R. P. Linstead, F.R.S.

The Plastics Institute

London: Waldorf Hotel, Aldwych, W.C.2, 6.30 p.m. "The Limitations of Plastics" by Dr. V. E. Yarsley.

Manchester Literary and Philosophical Society (Chemical Section)

Manchester: Reynolds Hall, College of Technology, 5.30 p.m. "Stainless Steel" films in Technicolour by Firth Vickers & Co., Ltd.

Society of Chemical Industry (Food Group)

London: Burlington House, Piccadilly, S.W.1. "Factors in Distribution affecting the Quality and Nutritional Value of Foodstuffs" Dr. G. A. Reay, Dr. E. H. Callow, Dr. M. A. Pyke.

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. "Review of Current Research on Springs and Spring Steels" by R. S. Jackson.

British Association of Chemists

Birmingham: The University, 6 p.m. Meeting.

British Coke Research Association

London: Lecture Theatre of Royal Society of Arts, 6 John Adam Street, W.C.2, 2 p.m. Conference on "Coal Blending for Carbonisation in Coke Ovens."

THURSDAY, OCTOBER 26

Royal Institute of Chemistry

Edinburgh: North British Station Hotel, 7.30 p.m. "The Scientific Examination of Pictures" by Dr. A. E. Werner. (Jointly with CS and SCI.)

Manchester University: Chemistry Lecture Theatre, 6.30 p.m. Sixth Dalton Lecture, "The Physical Chemistry of Iron and Steel" by Sir Charles Goodeve, F.R.S.

Pharmaceutical Society

Manchester: Houldsworth Hall, 7.45 p.m. "Modern Developments in Pharmaceutics" by Mr. B. J. Thomas.

The Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. "Continuous Casting Practice." Discussion, to be opened by D. Wood, M.A., and R. Chadwick, M.A.

FRIDAY, OCTOBER 27

Electrodepositors' Technical Society

Sheffield: Grand Hotel, 6.30 p.m. "Education in the Electroplating Industry," by C. Harris.

Royal Institute of Chemistry

Cardiff: Royal Hotel. Dinner. (Jointly with SCI, S. Wales section).

Cambridge: University Chemical Laboratory, Pembroke Street, 8 p.m. "Science in Criminal Investigation" by Dr. G. E. Turfitt.

The Plastics Institute

Manchester: Engineers' Club, Albert Square, 6.45 p.m. Discussion Evening.

International Tin Conference

The Secretary General of the United Nations has invited member nations "to discuss measures designed to meet the special difficulties which exist or are expected to arise concerning tin and, if considered desirable, to conclude an international commodity agreement." The conference will open in Geneva on October 25. Two delegations will represent the U.K. and British colonial and dependent territories.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EXPANSION RETARDED

Cement Industry and State Control

SOME factors which are deterring the cement industry from making the large expansions of output which current domestic and export conditions require were summarised by the chairman (Mr. F. R. Stagg) in his address to shareholders of the Ketton Portland Cement Co., Ltd., in Sheffield on October 12.

Opposition to the proposal to erect a cement works at Dove Holes, in the Buxton area of Derbyshire, had been raised and a public inquiry was held in July. The decision of the Minister of Town and Country Planning was still awaited, but if favourable, costs of fuel, power and cement-making machinery would have to be borne in mind.

Apart from the questions of finance and economics, said the chairman, the threat of nationalisation of the cement industry was a very disturbing factor. Since the vote on the Iron and Steel Bill, the Government had threatened nationalisation of almost everything on which it can lay its hands, and there seemed little doubt that cement was one of the industries foremost in its mind.

Under such conditions, said Mr. Stagg, the directors felt that they must move cautiously with the proposed developments. It would be wrong to shareholders to take a vital step without considering first the question: Are we going to be nationalised? and, secondly: If so, on what terms and conditions? They could not afford to take such a step in the dark.

"No Time to Waste"

LORD LYLE, president of Tate & Lyle, speaking to industrialists at Bournemouth last week on the far ranging threat of nationalisation, said: "Industries can be gobbled up with no more forewarning than the time it takes to lay a Bill before Parliament. The time to take action is now, before you find your own business named in a Parliamentary Bill."

"Trade and industry," he declared, "must persuade the public that free enterprise does not exploit its workers and rob the public; that it is not making too much money, and that its shareholders are not just parasites."

"Unless we can explode all this nonsense, then we are indeed lost. In the face of constant misrepresentations, free enterprise must state the facts clearly and boldly."

ENGINEERING STANDARDS

Butt Welding Steel Pipelines

SUCCESSFUL welding of circumferential butt joints in pressure pipelines by the metal-arc process calls for special techniques to secure consistent and satisfactory penetration without either the formation of cracks at the base of the welds or of icicles protruding into the bore of the pipe.

For consistent penetration and root fusion, two main methods are available. The first involves the use of a backing-ring which may be retained as part of the final joint or may be removable, and the second method requires a base run of weld metal deposited by the oxy-acetylene process.

The two themes are adequately covered, with diagrams, in "Recommendations for the Metal Arc Welding of Butt Welds in Steel Pipelines for Power Plant" (The British Welding Research Association, 2s.)

The methods given are stated by the BWRA to be the best generally available, but there are indications that the adoption of special techniques or specially trained workmen may enable backing-rings of oxy-acetylene base runs to be dispensed with. The association suggests, however, that any such proposal should be very carefully investigated to verify that welds made in all positions will consistently pass the test requirements.

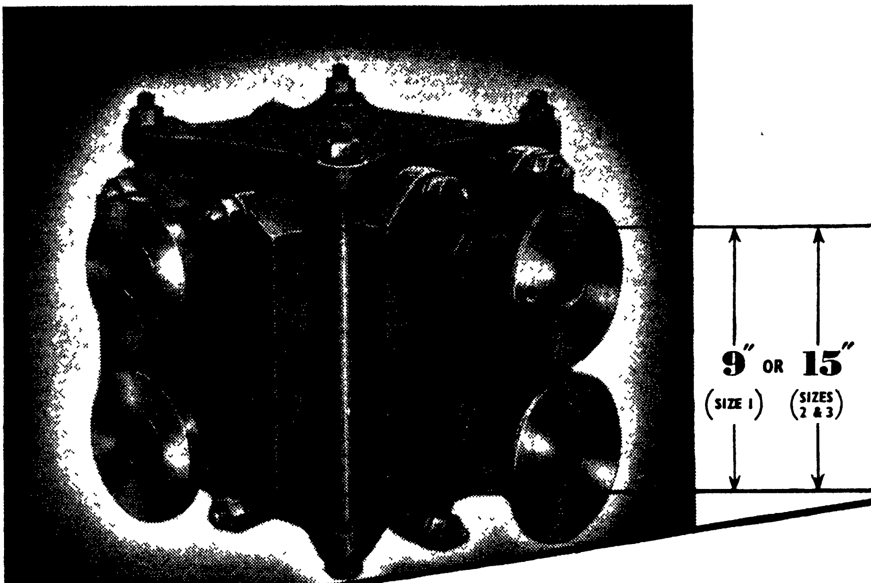
The memorandum covers parent metal; welding methods; reinforcement of welds; supervision of workmanship; heat treatment after welding; tests for quality of butt joints, etc., and includes 28 illustrations.

New Flake Non-ionic Detergent

WHAT is claimed to be the first 100 per cent active flake non-ionic detergent to be produced commercially in the U.S.A. has been announced by the Wyandotte Chemicals Corporation, Michigan. It is one of a new series of non-ionics developed for special applications, including wool scouring and certain metal cleaning processes. Hitherto, in the U.S.A., non-ionic detergents have been offered only in the form of liquids, pastes, or wax-like solids. Use was made of a hydrophobic unit not previously used.

U.S. Rubber Programme

The first all-purpose synthetic rubber plant to be reopened under the U.S. Government's expanded rubber programme started production at Port Neches, Texas, on October 11.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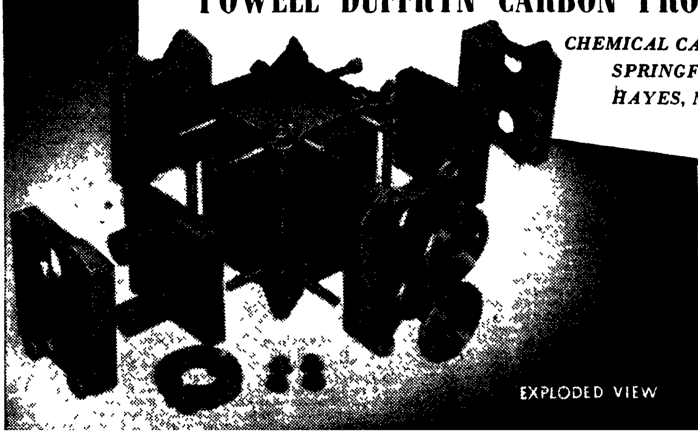
EXPLODED VIEW

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the production of isoquinolene derivatives.—R. T. Servita Gyogyszergyar es Vegyipari, G. Bruckner, G. Fodor, and J. Kiss. Oct. 8 1947. 645,139.

Production of hydrogen-containing gases. —Imperial Chemical Industries, Ltd., and W. Stannage. Oct. 20 1948. 645,140.

Process for the production of alkyl aromatic-hydrocarbons.—Universal Oil Products Co. Oct. 24 1947. 645,195.

Piezo-electric crystals.—Piezo Crystals, Ltd., and J. W. Richardson. Oct. 29 1948. 645,141.

Curing polyhydric alcohol-polycarboxylic acid condensation polymer compositions.—Johnson & Johnson (Great Britain), Ltd. Nov. 3 1947. 645,197.

Filaments of thermoplastic material and manufacture thereof.—Firestone Tyre & Rubber Co. Nov. 8 1947. 645,275.

Stable emulsions of artificial resins and processes for making them.—Ciba, Ltd. Nov. 11 1947. 645,028.

Preparation of phenols.—Yorkshire Tar Distillers, Ltd., D. W. Milner and E. C. Holdsworth. Aug. 17 1948. 645,144.

Production of polymeric compounds.—Soc. Des Usines Chimiques Rhonepoulenc. Dec. 9 1947. 645,067.

Heating plates for steam baths.—V. V. K. Rasanen. Dec. 12, 1947. 645,279.

Reduction and sintering of moulded bodies containing reducible metal compounds.—D. Primavesi. Dec. 29 1947. 645,030.

Method of introducing barium into a sealed vessel.—Philips Electrical, Ltd. Dec. 31 1947. 645,150.

Process for the production of titanium compounds which are free from, or poor in, iron.—Spolek Pro Chemickou A Hutni Vyrobu, Narodni Podnik. Dec. 31 1947. 645,152.

Lubricating compositions. — Aluminium Co. of America. Jan. 9 1948. 645,202.

Crude petroleum oil distillation process.—Standard Oil Development Co. Jan. 19 1948. 645,072.

Synthetic resinous products and methods of producing same.—Harvel Research Corporation. Jan. 26 1948. 645,208.

Method of and apparatus for sealing and annealing glass envelopes.—Compagnie des Lampes. Jan. 30 1948. 645,206.

Photographic diazotype transfer films.—General Aniline & Film Corporation. Feb. 9 1948. 645,211.

Solutions of aromatic polyesters.—Imperial Chemical Industries, Ltd., R. Hill, R. G. A. New, and S. M. Todd. Feb 11 1949. 645,032.

Solutions of nylon.—Imperial Chemical Industries, Ltd., R. Hill, R. G. A. New, and S. M. Todd. Feb. 11 1949. 645,033.

Process for the emulsion polymerisation of styrene.—Monsanto Chemical Co. Feb. 16 1948. 645,034.

Production of phosphate coatings on aluminium and aluminium alloys.—Pyrene Co., Ltd. Feb. 16 1948. 645,157.

Process for the preparation of thioketones and carbocyanine dyes.—Kodak, Ltd. Feb. 24 1948. 645,288.

Esterification using azeotropic distillation. —Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. March 5 1948. 645,218.

Mechanical treatment of artificial filaments.—Imperial Chemical Industries, Ltd., and R. Lipscombe. March 7 1949. 645,159.

Purification and isolation of penicillin.—Imperial Chemical Industries, Ltd., T. Leigh and J. M. G. Pryce. Jan 28 1949. 645,037.

Compositions containing cement and highly polymeric substances.—Dunlop Rubber Co., Ltd., F. Brown and W. Saul. Feb. 26 1949 645,291.

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The Chemical Age

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Hazards Undisclosed

IF there is a subject which deserves priority treatment to make at least the fundamentals known it is the serious one of radiation hazards in peaceful development of "atomic" techniques. Research workers in biology, biochemistry, medicine and, while rather fewer, in industry are using radioactive elements in steadily increasing amounts. This is a conspicuous tribute to the scale of development at Harwell in providing supplies and methods; but it is equally a challenge to all the radio-biological workers to make widely known the danger signs, the tolerance levels and the safeguards.

Large numbers of chemists, physicists, doctors and biologists are now being exposed, continuously or intermittently, to larger or smaller emissions of these penetrating radiations. Already in the U.S.A. more than one fatality has been reported. Here, happily, it can be said no life has been lost as a direct result of over-exposure. Even the reticence of the authorities for atomic energy development in the U.K. could not have concealed a matter so vital to other workers in that field. Some however, may have been disagreeably reminded by what has occurred in America that it is well to "Ask not for whom the bell tolls . . ." It remains vital for all who are using or likely to use radioactive material to know accurately the total permitted dosages, which the facts about the unfortunate first human casualties and extrapolation from animal experiments will establish.

The promise that much more may now be done to spread public information on this vital theme which some saw in the holding last week, in London, of a conference on "Biological Hazards of Atomic Energy" has turned out to be a hollow one, at least so far as immediate additions to the general fund is concerned. No adequate report of those discussions is possible; the commentary (page 600 of this issue) does not purport to be that. The organisers, the Atomic Scientists' Association and the Institute of Biology, held their meetings in private and disclosed no more than could be elicited by impromptu questions put forward at the Press "conferences" held at the conclusion of the two sessions. No summaries were issued (as for instance the Royal Institute of Chemistry issued for the Fermentation Conference last year) and no preprints. In this context, the list of titles of subjects discussed, which was made available, is to the majority not much more informative than a hieroglyph.

According to Dr. Catcheside, the

On Other Pages

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essence of the reported results on the effects of radiation may be summed up in this way. Radiation produces no new genetic effects, it merely accelerates existing genetic tendencies including the rate of mutation and the production of abnormalities. Of its more immediate biological implications, other speakers confirmed that the effect is destruction of tissue. The organism responds by more active growth which may then over-compensate the original destruction as in malignant cancerous growths.

We leave our readers to judge for themselves whether it is essential to have quickly a fair summary of the conclusion of the relevant papers, including details of character of radiation, time and dose. A final session of the conference was devoted to ethical and sociological issues. Wisely the organisers did not shirk these controversial—but so vital—issues, nor indeed should any scientist. And the thinkers who considered these implications for war and peace, were also themselves top-rank scientists.

The inadequacy of these and the few other revelations of the same scale of informativeness does, of course, not mean that the knowledge assembled in London last week on matters such as protective chemicals is to be permanently buried, like some radioactive waste at Harwell. It is in effect being placed in cold storage—apart from the fruitful effect of such exchanges as were made at the conference itself—pending publication by the organisers of the full texts. That, as Dr. Edward Hindle confirmed, will not be earlier than six months. Much can happen in six months and in the interval there will be no summaries or extracts.

An ironic commentary on this ill advised policy is the repugnance which most scientists feel—including several who expressed it at the conference—for the official secretiveness which surrounds atomic energy. Professor C. A. Coulson (professor of atomic physics, King's College, London), said he would not be associated with any policy of concealment. Professor Kathleen Lonsdale, F.R.S. (professor of chemistry at King's College), referred angrily to the withholding from her of facts about precautions in uranium mining. Such secrecy, she said, should have no part in a civilised community. With that, few will disagree and all will feel some disappointment that professional bodies, one, the biologists', of recent formation, should have perpetuated the "top secret" principle and involved to some extent the conspicuously candid British Association.

Notes and Comments

Yorkshire's Potash

HUNDREDS, besides the geologists, have waited for what may have seemed to them to have been an uncomfortably long time to hear of what was brought to light by the drills, which since the war have been probing in some places to depths of 5500 ft. or so, into the ancient evaporite beds of minerals beneath Eskdale and near Whitby. What Dr. Alexander Fleck has now disclosed so amply and explicitly to the Newcastle section of the Society of Chemical Industry outdistances in its promise of a rich yield of agricultural potash materials, sylvite (potassium chloride), sylvinite and some other forms, the optimistic guesswork of those who awaited the facts. Dr. Fleck and his organisation, I.C.I., Ltd., who have provided the stimulating facts about what was revealed in one Yorkshire site of about 12 square miles, would certainly resist any assumption at this stage that the great beds of potash salts lying amid the deep salt and anhydrite bands can certainly be made to yield up their wealth at an economic cost. Their intimate experience of the special hazards and costliness of chemical determination at 4-5000 ft. below the level of most laboratory benches will have ensured that they have not overstated the case. I.C.I. has spent around £170,000 on that research already. To those who have not experienced those sobering influences, however, some of the conclusions now advanced may afford a much more solid occasion for national celebration than, for example, the Festival of Britain.

"Enough for 140 Years"

THE salient facts given by Dr. Fleck are stimulating enough, even if one was not privileged to share the excitement which he admits affected all who saw "the great chunks of sylvite" which suddenly appeared in the cores from 3834 ft. in the first borehole in Eskdale, No. 3 at Sleights. While that Eldorado-like incident was certainly not the general experience while probing the depths around the Esk, the general summary contains plenty of considered estimates to quicken the imagination, such as Dr. Fleck's that within the particular small circle surrounding the I.C.I. and D'Arcy Exploration's boreholes there probably lies 213.5 million tons of sylvinite, of which 150 million tons should be 32 per cent KCl and the rest about half as rich. "A very appreciable addition to the natural resources of our country," is the conservative comment of Dr. Fleck, who notes that if 35 per cent of the deposits can be extracted, Eskdale alone should be able to support an annual consumption here of 500,000 tons of KCl for 140 years. It is a reasonable expectation that at some date very much earlier than 2090 chemists will have dealt effectively with the problem of making profitable the complex sulphate material, polyhalite, containing up to 15 per cent K_2O, in which it is thought that there is in Yorkshire at least as much potassium as in the sylvinite beds. Giving perspective to the whole picture revealed in these preliminary stages, Dr. Fleck says this:—

"The upper bed of sylvinite stands comparison in both the thickness and KCl content with the average of the commercially worked beds. The KCl content of the lower sylvinite is probably as good as that of any commercially worked potash bed, while its thickness is only rarely exceeded. . . ."

September's Record Exports

THE disparity between the trend of United Kingdom export trade as a whole and the sustained rise in chemical sales, which made the record total of £10,202,561 in September, no doubt reflects to some extent the anxiety of many countries to provide against future needs before national requirements narrow or close the channels. Yet the rising market for chemicals contrasts strongly with the reduction in most other export groups. Provision could not have been made for

the greatly increased totals of nearly all the basic materials and of some large groups of manufactures, such as insecticides, had there not been widely distributed improvement in productive capacity, notwithstanding the impediments which have complicated the procurement of plant and finance. The £10.2 million compares with rather less than £7 million earned by chemical sales last year and £7.5 million in 1948. It is difficult to believe that world markets will continue regularly to take more than £10 million worth of chemicals month by month from Britain, and by no means certain that the disposal on that scale of some of the basic items would not shortly impose serious limitations upon the flow of essentials to our own using industries.

Widespread Changes

THE prudent verdict on a change of such magnitude in the pattern of British chemical trade with the rest of the world will probably reject the conclusion that a permanent departure has been made from the level of £6-8 million per month which had prevailed since the war. If it is in fact artificial and transient, the wide distribution of the current request for this country's chemicals is all the more remarkable. Practically all the Continental countries have contributed very largely to the higher totals and Norway and Denmark have increased their orders on an equivalent scale. British chemicals can be credited on that account with having smoothed the problem of financing the programme to liberalise European trade. As earners of dollars, chemicals in September achieved not only a record level—at $677,000—but surpassed any forecast, however optimistic, which might have been made 12 months ago. The dollar total then was little more than 134,000.

Controls Retained

THE expanded scale of distribution of British chemicals around the world, especially perhaps the fourfold rise in September shipments to the U.S.S.R., gives no support for the suggestion by the Lord President of the Council in Parliament this week that rearmament and stock-piling may oblige the Government to restrict the use of commodities. While one example of comparative abundance does not necessarily dismiss Mr. Herbert Morrison's argument for scarcity tactics, his and the Government's case for preserving emergency powers and controls is thought to have disguised a piece of opportunism. Unwillingness to relinquish its grip on trading in such things as the non-ferrous metals characterised Government policy long before heightened tension in world affairs offered some excuse for it. So the Supplies and Services (Transitional Powers) Act, 1945, is to be given a fresh lease of life. In developing the policies by which they have wrought so marked an improvement in our trading position industries will still have to serve to a large extent as agents—with the privilege of bearing all the risks and supplying the knowledge and initiative. Was the "bonfire of controls" really only an *ignis fatuus*?

Uncertain Coal Supplies

THE chairman of the National Coal Board, Viscount Hyndley, speaking at the Institute of Fuel dinner in London on October 19, said the prospective coal supply this winter was causing him some anxiety. He had hoped that by now the autumn production drive would be well under way and that the results would have been felt. So far he could not say this was so.

The Board had been working hard on a national plan which would cover the reorganisation of the industry over the next 15 years. It was an immense task, but he expected to have the plan ready for publication about the middle of next month.

Describing attempts to minimise wasteful use of fuel, Lord Hyndley said: "We have recently given very serious thought to the generation of electricity at the pithead. One of the main advantages of this policy is that it provides an efficient means of using the almost unmanageable and untransportable wet fines generally known as 'slurries.'

"The Board also take a lively interest in the activities of the Chief Scientist of the Ministry of Fuel and Power—Dr. Roxbee Cox. We are particularly interested in his efforts to develop gas turbines using either solid fuel or the methane contained in the upcast air from the mines."

U.S. METAL CONTROLS

Limiting Exports in the N-F Group

THE extension of the present U.S. policy of restricting certain strategic exports is reflected in a statement received here last week from the U.S. Department of Commerce. This regulation is one of the "destination controls" and relates to non-ferrous metals and manufactures, upon which there was earlier a restriction. Licences are now needed for shipment to any country, except Canada, of the following metals and products:—

Bauxite concentrates including alumina. Aluminium and aluminium-base alloys, ingots, slabs, pigs, blooms, and other crude forms scrap solids, scrap borings, turnings and dross, bars and rods (including rolled and extruded), aluminium foil and leaf (less than 0.006 in.), mill shapes, wire (except woven-wire insect screen cloth), perforated aluminium sheets.

Copper and manufactures, not elsewhere specified. Brass and bronze diestocks, shims, bearings and bushings. Lead manufactures, not elsewhere specified.

Zinc and manufactures: scrap, photo engraving sheets and plates; sheets, plates and strips, not elsewhere specified; alloys, except brass and bronze; die castings; other forms, not elsewhere specified; zinc dust; battery shells and parts, unassembled; zinc manufactures, not elsewhere specified.

The Office of Industry and Commerce also announced that to prevent undue drain on domestic supplies, several non-ferrous metals will be licensed during the fourth quarter (October-December) on the basis of quantitative quotas. The groups concerned are broadly those now subjected to the destination licensing rule.

Strategic Purchases by Soviet Bloc

THE Milan Chamber of Commerce has drawn attention to the fact that many of Russia's satellites are procuring chemicals which might be useful in the event of war. *Il Tempo*, reporting this, says that purchases are at a very high level, some prices having increased ten-fold. Firms in Milan, Rome and Genoa are responsible for the exports, many of them working underground. Goods almost invariably pass through Trieste marked "Various merchandise" and usually involve glycerin, phenol, naphthaline and certain solvents essencial to the production of explosives. (Purchases by the Soviet Union of U.K. chemicals rose to £24,550 in September, compared with £6287 a year ago.)

ALUMINIUM RECORD

U.S. Raises Production and Imports

THE July output of aluminium in the U.S. was 63,518 short tons, the largest monthly total for six years. The U.S. Bureau of Mines, recording the increase, discloses that imports of aluminium to the U.S. in July were 17,620 short tons, an increase of 90 per cent over the June total. Receipts of crude aluminium from Canada in July were almost double the June total and imports from the United Kingdom were also increased.

An increase of 1.5 cents in the price of pig aluminium, to 18 cents per pound was recently announced by the Aluminium Co. of America, following a 10 per cent wage increase to its employees.

The price of cadmium in the U.S. has again, risen to \$2.40 lb., an increase of 25 cents on the July price of \$2.15. That, too, represented an increase of \$1.50 on the war-time figure of 90 cents per lb.

Supplies of copper and zinc remain scarce; defence orders have increased. A strike of stevedores in Chile is threatening to hold up exports of Chilean copper to the U.S. There is also concern about a strike of coal miners at the American smelting and refining company's plant at Rosita, Mexico, and its possible effect upon the immediate supply of zinc.

Because of the dwindling stocks of lead, November lead orders are now chiefly taken on the basis of the average price prevailing at the time of shipment, and no longer at the fixed price of 16 cents per lb. The present price of lead is 17.35 cents per lb.

Rising Manganese Imports

IMPORTS of manganese, chromium and tungsten to the U.S. in the first six months of 1950 were well ahead of the 1949 rate, according to figures published by the Department of Commerce. The amount of manganese imported during that period was equal to 80 per cent of the total for 1949. Imports from Russia were negligible but India sent nearly twice as much manganese as in 1949. The Union of South Africa and the Gold Coast both exceeded their 1949 figures.

Imports of tungsten in the first six months of 1950 exceeded those of all 1949 by 27 per cent. Chrome imports during that period were about the same as in the first six months of 1949, a loss in Russian shipments being largely made up from Southern Rhodesia.

£10.2 m. EXPORT RECORD

Chemical Total Rises £1 m. in a Month

THE total value of chemical exports in September, including drugs, dyes and colours, at £10,202,561 was roughly £1 million higher than the July and August figures, and about £3 million more than in September 1949. It constitutes a record. Outstanding values, (the figure for the corresponding month of 1949 shown in brackets), were: ammonium sulphate £404,196 (£293,625); British West Indies took £109,090 of this total against none in September last year. Bleaching powder £22,179 (£13,484). Sulphate of copper £219,921 (£52,721), of which £23,742 went to Commonwealth countries; £4700 (nil) to the Irish Republic, £2614 (£2) to Italy and £1572 (nil) to Egypt. Of the disinfectants total of £353,380 (£229,867) £40,484 (£28,494) went to India, £21,442 (£7865) to Australia, and £31,351 (£5780) to Brazil. A large purchaser of sodium carbonate—total £371,109 (£144,521)—was Brazil £81,572 (£32,254). Caustic soda realised £579,710 (£238,585), of which India contributed £105,500 (£3), and Brazil £525,685 (£96,334). Typical totals were these:—

	Sept., 1950	Sept., 1949
	Gal.	Gal.
Cresylic acid	310,337	112,206
	Lb.	Lb.
Salicylic acid	135,713	373,315
Value of all other sorts of acid ...	£160,627	£119,562
	Tons	Tons
Sulphate of alumina	3,009	2,397
Other aluminium compounds ...	1,739	627
Ammonium sulphate	20,911	15,677
Ammonium nitrate	2,308	2,221
All other sorts of ammonium compounds	1,459	1,775
	Cwt.	Cwt.
Bleaching powder	17,246	12,430
All other bleaching materials ...	9,305	12,427
Collodion cotton	1,615	1,378
	Tons	Tons
Copper sulphate	4,140	1,381
	Cwt.	Cwt.
Disinfectants, insecticides, etc. ...	42,816	37,172
	Tons	Tons
Fertilisers	1,304	1,016
Value of gases (compressed, liquefied or solidified)	£28,304	£20,057
	Cwt.	Cwt.
Lead acetate, litharge, red lead,	17,722	7,193
	Gal.	Gal.
Tetra-ethyl lead	162,876	154,260
	Tons	Tons
Magnesium compounds	1,087	801
	Cwt.	Cwt
Nickel salts	7,824	3,625
Potassium compounds	7,870	4,352
	Tons	Tons
Salt	22,209	18,456
	Cwt.	Cwt.
Sodium carbonate	642,283	278,527
Caustic soda	437,026	206,406
Sodium silicate	34,110	40,095
Sodium sulphate	104,340	30,667
All other sodium compounds ...	110,627	70,970
	Gal.	Gal.
Tar, creosote, anthracene oil ...	796,918	2,854,128
	Tons	Tons
Zinc oxide	1,796	1,147
Total value of chemical manufactures (excluding drugs and dyestuffs)	£5,865,999	£3,455,547
Value of quinine and quinine salts	£49,005	£49,855
	Lb.	Lb.
Acetyl-salicylic acid	235,076	165,190
	100 International Units	100 International Units
Insulin	1,239,400	784,70
	Mega Units	Mega Units
Penicillin	1,299,839	848,451
Total value of drugs, medicines and preparations	£2,196,176	£1,565,692
Total value of dyes and dyestuffs ...	£942,700	£970,660
Total value of paints, pigments and colours	£1,197,686	£1,002,636
Total value of chemicals, drugs, dyes and colours	£10,202,561	£6,994,535
Total value of all plastic materials	£722,634	£445,064
	Cwt.	Cwt.
Chemical glassware ...	1,401	1,318
Value	£45,017	£50,901
	Cwt.	Cwt.
Fans	5,393	4,984
Value	£139,244	£145,196
	Cwt.	Cwt.
Furnace plant	10,539	5,981
Value	£106,161	£70,183
	Cwt.	Cwt.
Gas and chemical machinery ...	13,095	19,375
Value	£149,297	£284,272
Value of scientific instruments (optical)	£74,825	£85,029
Value of Thermometers, mercury in glass instruments, etc. ...	£31,966	£43,104
	Cwt.	Cwt.
Air and gas compressors and exhausters	15,377	12,587
Value	£281,596	£275,163
Non-Ferrous Metals—	Cwt	Cwt.
Aluminium and aluminium alloys	95,085	88,120
Value	£1,117,312	£1,065,730
	Lb.	Lb.
Bismuth metal (not including alloys)	61,807	1,331
Value	£44,536	£687
	Cwt.	Cwt.
Brass and other alloys of copper, other than metal alloys ...	88,210	98,841
Value	£1,048,808	£904,282
	Tons	Tons
Copper	6,985	8,508
Value	£1,454,959	£1,245,710
Lead ,unwrought, sheets, etc. ...	361	275
Value	£53,332	£48,548
	Cwt.	Cwt.
Nickel and manufactures of ...	17,888	27,398
Value	£342,077	£315,241
	Cwt.	Cwt.
Nickel alloys	2,737	3,24
Value	£52,448	£54,265
Value Tin, unwrought ...	£823,101	£316,972
Value Tungsten	£21,382	£15,676
Value Zinc	£113,231	£58,840
Total value of group	£7,342,027	£5,136,462

BRITISH AGRICULTURAL CHEMICALS

Expanding Test and Production Plant at Yalding

SOME impression of the debt which territories all over the world owe to British scientific and technical enterprise for safeguarding food crops emerged during the official inauguration at Yalding, Kent, last week, of the extended laboratories of Plant Protection, Ltd. (THE CHEMICAL AGE, 63, 568).

Mr. A. R. N. Roberts, a director, welcoming the Press and other guests, said the event symbolised the attainment of a new stage in the science and practice of crop protection. He described the part which Plant Protection, Ltd., had played in the fight against the Colorado beetle in this country and in combating the locust menace in Africa and the Middle East. Towards suppressing the latter, the British and Colonial Governments had guaranteed £1 million a year for three years.

Plant Protection, Ltd., was proud of the fact that Mr. O. B. Lean, the technical head of its biological research station at Fernhurst, had been summoned to an international conference in Iran to put his almost unrivalled knowledge of the locust problem at the disposal of the Middle East Governments.

Agrocide 7, based on benzene-hexachloride, the chemical most widely used throughout the world as an anti-locust bait, was devised in the Yalding Laboratories of Plant Protection, Ltd. To combat these and the many other pests and diseases which were denying man the full harvest of his labours, the mobilisation of all the resources of science was obviously imperative.

As one instance only of the growing need for this effort, Mr. Roberts mentioned that in the financial year which ended on September 30, exports, as represented by sterling and in tonnage had greatly exceeded those of any previous year.

In 1950, Plant Protection, Ltd., had concluded arrangements with the Chipman Chemical Co. in the United States for the manufacture of its products on the other side of the tariff barrier. Such additions to Britain's dollar earnings would be particularly welcome, but there

Part of the well equipped semi-technical laboratory at Yalding, showing (left) the filter press, drum dryer and homogeniser for emulsions. On the right is the powder mixer

were few countries of the free world in which the products of Plant Protection, Ltd., were not being used.

Sir Wallace Akers, I.C.I. director of research, who performed the official opening of the works extensions, said that in the world at large 700,000 different insects had been identified, and they were still being distinguished at the rate of about 7000 new species a year. A good many of these attacked plants, and the number gave some idea of the magnitude of the scientists' work.

He described the liaison between I.C.I., Ltd., and Plant Protection, Ltd. The manufacturing divisions of I.C.I. were constantly evolving new chemicals. Those which were believed to be of potential value in the control of plant pests and diseases, or of weeds, were sent to Plant Protection's agricultural research stations at Hawthorndale and Jealott's Hill, and the most promising then found their way to Yalding for determination of their probable application in agriculture on a commercial scale.

The largest and principal departments at Yalding are the grinding shed, the powder mixing shed and the emulsion department. The equipment of all these sections is represented in miniature in the present plant of the semi-technical laboratory, to which the extensions have been made. The most important function of this laboratory, however, will now be the development of new processes, and ample room has been left for the erection of new plants. Two dry stores, one for raw material and the other for finished experimental batches ready for field trials, as well as outside storage for barrels and drums, have been provided.

The opportunity has been taken to install steam, compressed air and vacuum services, and to supply these not only to the semi-works-scale laboratory but also to the new analytical laboratory and to the formulation laboratories.

The technical department at Yalding, in providing most of the chemical services to Plant Protection, Ltd., works in close collaboration with the I.C.I. divisions, notably with the dyestuffs, general chemicals and Nobel divisions.

Biological Hazards of Atomic Energy

THE view that the number of applications from industry for radioactive isotopes had been disappointingly small was expressed by scientists at the Press conferences held following the several sessions of the conference. in London on October 20 and 21, on the "Biological Hazards of Atomic Energy." The joint organisers were the newly formed Institute of Biology and the Atomic Scientists' Association with the support of the British Association.

"Disappointed"

Dr. Edward Hindle, who presided at the first of these Press meetings, summing up the views, said the isotopes were available if industry wanted them and was in a position to take and use them. There had, he said, been many cases of firms going to Harwell to inquire, and even setting up special laboratories, and then leaving the matter undeveloped.

At a subsequent Press meeting, in reply to a question from THE CHEMICAL AGE, Sir John Cockroft confirmed that although the Harwell authorities had been "to some extent disappointed" at the number of industrial firms who had taken advantage of the availability of isotopes, the number appeared to be growing satisfactorily. "We should, however, like to see the number increase enormously," he said.

Asked if the relatively few applications from industrial firms was influenced by the shortage and high price of the new equipment they would need, or by lack of technical knowledge, or all these things, Sir John Cockroft said it was a fact that the necessary equipment had been rather scarce, but that some firms appeared to be willing to spend the money if they could get the equipment. Bearing in mind the moderate number of industrial firms which had at present received deliveries of isotopes, or had at least made definite applications for them, he would not like to say there was a definite shortage of this equipment, but there might be some difficulty if the number of applicants increased as was hoped they would.

Sir John Cockroft said something had been done to provide industrialists with the technical knowledge desirable. A small group had been set up at Harwell to help them, and a training course for representatives of industrial firms on the use of radioactive isotopes in industry was shortly to be started.

Inquiry, after the conference, at the Ministry of Supply, elicited the following information about the latest figures of industrial firms which had taken advantage of available isotopes:—

Firms which gave orders for isotopes for

industrial use in May numbered 20; in June, 27; July, 47; and August, 53.

There were 429 deliveries in August of isotopes to industry. These included, mainly, 785 millicuries of phosphorus, 254 millicuries of radioactive iodine and a small amount each of carbon and cobalt.

Industrial consignments of isotopes are not usually of strong radioactivity; they are mainly between 10-30 millicuries per source.

At the Press conference following the morning session—which was devoted to "Biological and Medical Effects of Nuclear Radiations"—Dr. E. E. Pochin (Medical Research Council Department of Clinical Research, University College Hospital, London), who had given a paper on 'Control of Hazards and Irradiation in the Clinical Use of Radioactive Iodine," said scrupulous care was taken in the selection and screening of hospital personnel who were to handle the isotopes for clinical use and the related apparatus. Outside of the Hospitals similar care was taken.

Safeguards Adequate

In response to requests from Press representatives after the afternoon session on October 20, Professor W. V. Mayneord (Royal Cancer Hospital) briefly reviewed national and world organisation of protective measures against radiation hazards. They had arrived at certain basic amounts which could be tolerated.

Mr. W. Binks (National Physical Laboratory) said that of the personnel working in the atomic energy establishments in Britain, about 75 per cent were getting about a fifth of the radiation they could tolerate; this percentage was also true of hospital personnel, radiographers, etc. The radiation arose mostly through defects in machinery, but the level of hazard was still too low to necessitate any closer protective measures than were at present taken, and the need for "hospitalisation" scarcely ever arose.

Professor J. S. Mitchell (Department of Radiotherapeutics, University of Cambridge), who had previously given a paper on "Tolerance Levels for Fast and Thermal Neutrons", said the animation of fast neutrons from apparatus like cyclotrons could cause damage to the eye, such as an ordinary cataract, with, however, no impairing of vision. Only one such case had been seen here, but there had been several in the United States.

Statutory Control

Sir John Cockroft, in reply to further questions, said there was likely to be a new statutory committee of the Ministry of Supply which might, in course of time, make it compulsory to observe the general safety level of tolerance of radiation which had been arrived at. This level was already being very generally observed in industry.

Dr. J. Loutit (AERE, Harwell) said that thio-urea, some cyanide derivatives, and certain other biochemicals had been found to be protective against radioactivity if they were induced into the human body before exposure. The percentage of protection of these substances varied greatly, but generally speaking they afforded at present no more than 15-20 per cent measure of protection. The figure had been increased to 100 per cent under strict laboratory conditions, but all the substances which had been tried out in the laboratory were in themselves strongly toxic. Professor Back, of Liège, had done much of this experimentation.

Chalk River's Advanced Particle Accelerator

A NEW electrostatic accelerator, capable of producing emissions of charged particles of accurately defined energy and direction has been installed at the Chalk River atomic energy plant of the Canadian National Research Council. It will be the source of high speed particles for breaking up atomic nuclei and will be supplementary to the atomic pile.

The machine, which weighs 14 tons and operates at 4 million volts, was built in the radio and electrical engineering division of the National Research Council at Ottawa, in close collaboration with the inventor, Dr. Van de Graaff, of the Massachusetts Institute of Technology.

The initial experiment performed with the new machine was the disintegration of lithium by protons to produce neutrons and a radioactive beryllium isotype. As this reaction had been carefully studied in other laboratories, the experiment enabled the voltage developed by the Chalk River generator to be standardised. Work is now proceeding to concentrate the accelerated particles into a narrower band —of about .05 in. diameter. An extensive programme of fundamental research will then begin.

RIC EXAMINATIONS

Eight New Fellows

THE Royal Institute of Chemistry has announced the pass list for the examinations held in September. For the Fellowship there were eight successful candidates, as follows:—

Branch C: Organic Chemistry.—WILLIAM CHARLES GARRATT, B.Sc. (Lond.); GORDON WILLIAM NENDICK, B.Sc. (Lond.).

Branch E: The Chemistry, including Microscopy, of Foods and Drugs and of Water.—ELIATHAMBY CHINNARASA, B.Sc. (Lond.); HARRY POLKINHORNE, B.Sc. (Lond.); EDWARD JOHN ROLFE, B.Sc. (Lond.); WILLIAM CUTHBERT JOHN SMITH; ROBERT CLARENCE SPALDING, M.A. (Cantab.); RALPH EDWARD WESTON, B.Sc. (Lond.).

The 21 new Associates who qualified at the September examination were these:—

BARNES, Sidney Charles, College of Technology, Manchester; BARRETT, Ronald Leon, B.Sc. (Lond.), South-East Essex Technical College, Dagenham, and Wigan and District Mining and Technical College; BIRKETT, Leonard, Harris Institute, Preston; CARR, Arnold Ernest, Royal Technical College, Salford; DEARDEN, Jack, Royal Technical College, Salford; DUXBURY, Donald, Munioipal Technical College, Blackburn; FARRAR, Sydney, Royal Technical College, Salford; FORBES, Derek Guthrie, B.Sc. (Lond), GEORGE, Michael Rainforth, Municipal Technical College, Hull; GRINDELL, Clive, Municipal Technical College, Hull; LAMBERT, Edgar, Lancaster and Morecambe Technical College; MORTIMER, Miss Aileen Marion, University College of the South-West, Exeter; ROUT, Peter George, College of Technology, Liverpool; SCHOFIELD, Harold James, B.Sc. (Lond), Municipal Technical College, Hull; STOTT, Alan Fowler, B Sc. (Lond.), Royal Technical College, Salford; TOWLER, John, Robert Gordon's Technical College, Aberdeen; TURNER, Peter Harry, Central Technical College, Birmingham; TUTT, Derek Edward, Woolwich Polytechnic, London; VICKERS, Clive, Municipal Technical College, Hull; WILLETT, Eric Arthur, West Ham Municipal College, Sir John Cass College, and Imperial College, London; YOUNG, George Raymond, Munciipal Technical College, Hull

Toxicity of Polyethylene Glycols

INFORMATION developed during recent years upon the toxicological actions of the fluid and solid polyethylene glycols is summarised in an article appearing in the *Journal of the American Pharmaceutical Association*—Scientific Edition, *39*, 349 (1950). The authors, Henry F. Smyth, Jr., and associates of the Mellon Institute of Industrial Research, Pittsburgh, have re-interpreted and supplemented the information and present evidence in the report. Their conclusions confirm the earlier work indicating that acute oral toxicity, dermal toxicity and irritating properties of the polyethylene glycols are very low. The safe rat dose of Carbowax 1500 is now known to be substantially greater than originally reported, and of Carbowax 4000, slightly greater.

ANALYSTS' RESPONSIBILITIES

Advisor and Public Guardian

REGRET that the Ministry of Health was proposing to take the responsibility for bacterial examinations from the public analysts, who were well qualified for that work, was expressed by Mr. T. MacLachlan in the course of his lecture on "The Public Analyst and His Work" at a recent meeting of the London and S.E. Counties section of the Royal Institute of Chemistry.

The public analyst, he said, was a scientific advisor to his authority and was concerned among other things with the question of water purity, sewage, bacteriology of water and milk, and the causation of dermatitis by chemicals.

It was the duty of the public analyst to give unbiased reports without fear or favour. The adulteration of foods had, generally speaking, decreased—at least from 1893 to 1938—although there was some increase during the war years. Certain forms of contamination, such as lead in beer from lead pipes in public houses, the use of glycerin in so-called liqueurs, the "near beer" racket and the toxicity caused by, for example, the use of pentaerithrityl stearate as a fat extender (this oxidises in the body to oxalic acid) were mentioned.

The public analyst, however, was not out just to catch people but to assist the manufacturers to maintain high standards and even to suggest uses for materials not suitable as foods, etc.

Analytical Chemistry Congress

THE International Congress on Analytical Chemistry is to be held in Britain in 1952. Meetings will be held in Oxford, beginning on September 4, the technical sessions in one of the main university buildings.

Arrangements for the congress are being made by a general committee under the chairmanship of the president of the Royal Society, Sir Robert Robinson, O.M. The honorary treasurer is Sir Wallace Akers, C.B.E., and R. C. Chirnside, F.R.I.C., is the honorary secretary.

It is expected that a meeting of the board of Section V, Analytical Chemistry, of the International Chemistry will be held in Oxford during the same week.

Open Day at Steel Laboratories

The British Iron and Steel Research Association is holding an "open day" at its physics laboratories at 140 Battersea Park Road, London, S.W.11, on November 9 and 10.

Parliamentary Topics

GOVERNMENT buying of zinc must be continued at present owing to the limited amount of zinc available in world market, stated Mr. G. R. Strauss, Minister of Supply, in the House of Commons on October 23. The Minister, replying to questions by Mr. John Grimston, said discussions about reducing the forward premium recently imposed on raw copper had been taking place with the industry, but no alterative generally acceptable to consumers had been found. Further representations from the industry would be considered.

THE availability of cortisone for sufferers from rheumatoid arthritis was raised by Mr. Edward Evans. In reply, Mr. Herbert Morrison, Lord President of the Council, said an extensive programme of co-ordinated research on cortisone and related substances was being carried out under the auspices of the Medical Research Council and other bodies; adequate funds were available to develop the work. The question of providing cortisone for the routine treatment of patients was outside the council's province. Much more research was necessary, he was advised, before the drug could be safely recommended for general use in rheumatoid arthritis.

WINTER stocks of coal at the end of October would be about 400,000 tons short of the target, stated Mr. P. Noel-Baker, Minister of Fuel and Power in a written answer. In recent weeks the output of deep-mined coal had been less than estimated; the output of opencast coal had been reduced by heavy and continued rain. In consequence, stocks at the end of October were expected to be about 15,750,000 tons. To this must be added about 300,000 tons which, as the result of the summer prices scheme, were now in the consumers' cellars instead of in the coal merchants' stocks.

TOTAL gasification of nearly 200 tons of coal had been effected since the seam at Newman Spinney was ignited just over three months ago, stated Mr. P. Noel-Baker, Minister of Fuel and Power, in a written reply. The quality of the gas so far obtained was good and it was hoped that the experiment would ultimately lead to the commercial production of gas suitable for the generation of power.

INADEQUACY of pay for research scientists and workers engaged on atomic energy projects compared with opportunities available in private industry were raised by Mr. A. R. Blackburn. Mr. G. R. Strauss, Minister of Supply, denied that there was any great discrepancy. The pay of research scientists and workers in his Department was under continual review.

Commons Questions About Missing Scientist

THE disappearance of Professor Bruno Pontecorvo, a research scientist at Harwell atomic research station was the subject of questions in the House of Commons this week.

Mr. G. R. Strauss, Minister of Supply, said Dr. Pontecorvo was a senior principal scientific officer at Harwell, that he had been granted leave of absence on July 25 and was due to return on August 31. The professor had accepted and was shortly due to take up an appointment at Liverpool University.

Dr. Pontecorvo was born in Italy. In 1943 he became a member of the Joint Anglo-Canadian atomic energy team at Montreal and three years later was transferred to the Ministry of Supply atomic energy organisation, remaining in Canada until 1949 when he was posted to Harwell. He became a naturalised British subject in 1948. For several years Dr. Pontecorvo's contacts with secret work had been very limited.

[Professor Oliphant, now director of physical research at the Australian National University, said in Canberra that the doctor, while freely discussing his work had never mentioned to him any moral feelings about the atom or hydrogen bombs or political matters.

Although an associate of Fuchs, they were not engaged on the same work. Before his resignation from the research centre at Harwell he was working on advanced tests of nuclear physics research.]

"Discovering Airdrie"

The development of the chemical and pharmaceutical industries in Lanarkshire forms part of the current industrial exhibition of Aidrie. A new bitumen-bound rubberised material for floor covering is among the items displayed.

Potassium Salts in N.E. Yorkshire

by ALEXANDER FLECK, D.Sc., F.R.I.C.*

DRILLING for potash in England is by no means an easy, straightforward piece of work and, in addition to requiring skill, it is costly. The boreholes which have been put down cost about £45,000 each, and the expenditure so far incurred by I.C.I. for obtaining the cores and for their interpretation and proper storing is something of the order of £170,000.

It was the possibility of finding considerable quantities of potassium-containing brine that gave the justification to the I.C.I. to hazard the necessary expenditure. I should say at once that, considered as a search for potash-bearing brine, the exploratory boring programme has been a complete failure.

In the D'Arcy borehole at Aislaby, the deep brine containing potash was observed near the top of the Lower Permian limestone at a depth of 4800 ft. from the surface. But, owing to the expected dipping of the strata combined with a thickening of some of them, the top of the Lower Limestone of the Permian did not appear until a depth of about 5470 ft. had been reached. The limit of the drilling equipment being a depth of 5500 ft., only about 30 ft. of this limestone could be penetrated.

No Deep Brine

There was no evidence of the existence of deep brine, and if there is a brine reservoir in the area of this borehole it must be lower down in the unexplored thickness of the Lower Limestone. Since by the time the final depth had been reached it had become clear that the main objective in the investigation should be the further exploration of the salt beds in which substantial quantities of sylvite (mineral potassium chloride) had been discovered, it was decided to spend no further time at this stage on the search for potash brine.

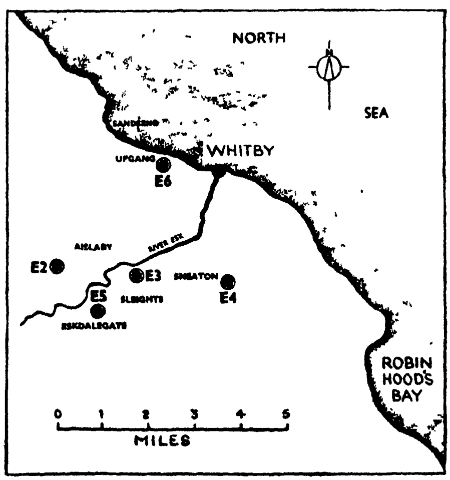
I should like to mention the interesting and quite unexpected discovery that at the base of the Keuper marls there is a bed of rock salt about 100 ft. thick. As is well known, the vast salt deposits of Cheshire and Lancashire are of Keuper age, but so far as I am aware Keuper salt has not hitherto been conclusively proved anywhere east of the Pennines. The salt deposits of Tees-side are unquestionably Permian.

With so few boreholes one cannot be absolutely certain, but our own view is that in the Whitby district the formations between the top of the Upper Limestone of the Permian and the top of the Lower Lias lie regularly and evenly one above the other throughout the area. This is not to say that the succession of strata within each formation was also regularly laid down. Unfortunately, this is not so. There is a strong temptation to conclude that here we have an example of a succession of even beds sloping gently towards the east and north.

The strata with which we are mainly concerned are the Permian evaporite beds which lie below the Bunter and from which they are separated by several hundred feet of Saliferous Marl. This formation is composed of a series of strata which change in a downward direction from marls alternating with sandstones to marl bands which are sometimes pure and sometimes admixed with particles of anhydrite. At the bottom of the formation is a thin band of anhydrite, about 2 ft. thick, and then a thin band of marl with rock salt inclusions. Below this comes what we have called the Upper Salt.

First Borehole

Our first borehole was Eskdale No. 3 at Sleights, the drilling of which was started on June 24, 1948, and ended on



* In a paper—of which this is an abstract—before the Newcastle Section of the Society of Chemical Industry, on October 17. It is reproduced in full in the society's journal, *Chemistry and Industry* (October 17)

March 16, 1949. Rock salt (halite) was encountered at a depth of 3598 ft. in the form of coarse crystals varying from colourless to flesh-pink. The cores continued to be composed of nothing but crystalline halite with occasional marl inclusions until at 3675 ft. the appearance of the cores changed dramatically—the flesh-pink halite being now mixed with irregularly-shaped blood-red coloured crystals which were quickly recognised as sylvite (potassium chloride), the colour being due to impurities.

After 22 ft. the sylvite crystals were no longer present, and from that depth until 3743 ft. there was nothing but halite with marl inclusions. A bed of anhydrite was found between 3743 ft. and 3769 ft., this latter depth representing the bottom of the upper evaporites.

Down to 3770 ft. the core recovery had been excellent, but for the next 47 ft. recovery was poor. The material recovered in the core barrel was largely red marl with bands of halite.

Mineralogical examination established the presence of carnallite in the marl. Carnallite ($KCl.MgCl_2.6H_2O$) is soluble in calcium chloride solution, and it was inferred that the marl bels *in situ* contained a substantial quantity of the mineral, which is so soluble that it is one of the last to be deposited in an evaporating sea.

Surprisingly, in view of what I have just said, the material in the strata immediately below the Carnallite Marl was halite and not a potash salt—flesh-pink halite just as in the Upper Salt. Then suddenly, at a depth of 3834 ft., sylvite appeared in obviously considerable concentration among the halite—great chunks of it that caused much excitement to all who saw them—especially since this went on for over 30 ft. before the cores were once more composed of halite only.

Analysis revealed that the average KCl content over this thickness is at least 40 per cent and perhaps as much as 45 per cent. At 4142 ft. anhydrite bands began to alternate with halite, the latter persisting until 4192 ft. Over the next 8 ft. the anhydrite became more and more dolomitic, the top of the Upper Limestone being reached at 4200 ft., by a coincidence almost exactly the same depth as in the Eskdale No. 2 borehole which the D'Arcy Company had drilled at Aislaby.

A summary of the strata encountered in Eskdale No. 3 borehole is given in Table IV.

In these lower evaporite beds the rock was so hard that coring became too laborious and expensive to continue, and even straight drilling became a very slow process. The total thickness of rock salt is estimated to be 470 ft., and that of mixed polyhalite anhydrite to be 449 ft. In the latter the polyhalite content varied from nearly pure material to mere traces.

TABLE IV

Eskdale No 3 Borehole —Lower Evaporite Beds

Between		
4383 ft. and	4424 ft.	rock salt with some anhydrite
4424 ft.	4496 ft.	rock salt
4496 ft.	4556 ft.	banded rock salt and anhydrite
4556 ft.	4772 ft.	anhydrite with some rock salt
4722 ft.	5097 ft.	polyhalite with anhydrite
5097 ft	5226 ft.	polyhalite and anhydrite with increasing amounts of rock salt
5226 ft	5464 ft.	rock salt with some anhydrite and with dolomite near base
5464 ft.	5478 ft.	Dolomitic marlstone and anyhdrite
5478 ft.	5500 ft.	Dolomite limestone

For Eskdale No. 3 borehole one can say with confidence that in the Upper Salt, between the depths of 3675 ft. and 3697 ft., there is a 22 ft. bed of sylvinite (a physical mixture of halite and sylvite crystals) containing 15 to 18 per cent of KCl by weight; and that in the Middle Salt, between 3834 ft. and 3865 ft., there is a 31 ft. bed of sylvinite containing 40 to 45 per cent of KCl. The potassium chloride does not disappear below the depths of these two beds, but persists down to the bottom of the salt beds to the extent of between 1 and 3 per cent. There was no evidence of potassium chloride in the Lower Salt.

TABLE III

THICKNESSES OF THE DIFFERENT STRATA AT THE VARIOUS ESKDALE BOREHOLES

Borehole	E.2	E.3	E.4	E.5	E.6
Location	Aislaby	Sleights	Sneaton	Eskdalegate	Upgang
Height above O.D.	403 ft.	43 ft.	265 ft.	240 ft.	78 ft.
Formation			*Thickness in feet*		
Drift and Estuarines	—	—	352	—	128
Upper Lias	50	—	228	45	232
Middle Lias	260	43	230	100	220
Lower Lias	929	1027	808	913	780
Rhaetic	61	68	55	71	64
Keuper Marl	890	995	880	984	900
Bunter Sandstone	1090	1087	1002	—	1146
PERMIAN					
Saliferous Marl	375	378	476	–	308
upper salt	185	145	114	—	180
anhydrite	20	26	28	—	26
marls	60	48	40	—	55
middle salt and anydrite	276	383	239	—	243
Upper Limestone	117	183	—	—	—
bottom salt, anhydrite, polyhalite	460	1081	—	—	—

According to published information, the average KCl content of the deposits worked in the Western Zone of Germany is not more than 20 per cent, the beds varying greatly in thickness but frequently being less than 10 ft. thick. The results I have quoted, therefore, lead to the view that if the two sylvinite beds in Eskdale persisted with comparable thicknesses and KCl content over an area of, say, 10 square miles, this district could claim to possess potash deposits among the richest, though perhaps also the deepest, potentially workable deposits so far discovered. Even on a more pessimistic outlook there was ample encouragement to sink more boreholes, and this we proceeded to do.

One borehole (Eskdale No. 4) was sunk near the village of Sneaton, at a point two miles due east of No. 3. Drilling started on May 5, 1949, and ended on November 1, 1949. The depth reached was 4458 ft., drilling being stopped when it became certain that the Upper Limestone had been entered.

The top of the Upper Salt was found to be at a depth of 4031 ft., and the cores obtained below that depth were predominantly flesh-pink or red-brown halite, thought there were some bands with a considerable content of red marl. Between 4080 ft. and 4095 ft. was a bed of sylvinite, which on sampling and analysis was declared to be a thickness of 14 ft. 4½ in., containing an average of 9.65 per cent KCl. Below this bed was more halite, anhydrite coming in at 4145 ft. and the bottom of the anhydrite forming the base of the Upper Salt bed being found at 4173 ft.

As in No. 3 borehole. the next formation was Carnallite Marl, which extended from 4173 ft. to 4213 ft.

At No. 3 borehole the Carnallite Marl lay above 17 ft. of halite. At No. 4 there was only a 4½ in. band of halite and then, at 4213 ft. 4½ in., sylvinite appeared again. But as the cores came to the surface it became increasingly evident that in the Middle Salt at this borehole we had found not one bed but a series of thin ones. Four distinct bands of sylvinite can be recognised, the intervening bands being rock salt containing a little KCl and variable quantities of marl in which the Geological Survey detected carnallite.

Going downwards, there are 12 in. containing 37 per cent KCl; 12 in. containing 3 per cent; 25 in. containing 60 per cent; 45 in. containing 4 per cent; 120 in. containing 38 per cent; 120 in. containing only 2 per cent; and 58 in. containing 38 per cent.

These compositions I have just quoted are in round numbers, and the weighted average composition of the total thickness of 32 ft. 10 in. between the bottom of the Carnallite Marl (4213 ft.) and the bottom of the lower of the four sylvinite beds (4245 ft. 10 in.) works out at 24.68 per cent KCl. Below this was halite again, with small but diminishing traces of KCl, and at 4330 ft. it was decided that it was too dangerous to continue coring owing to the ever-increasing amount of caving of the borehole wall.

Summarising the results from this borehole, therefore, one may say that, as at No. 3 borehole, two groups of sylvinite beds had been shown to exist, one in the Upper Salt and one in the Middle Salt. Admittedly, neither of them was so rich in potash at Sneaton as at Sleights, but it was still a good deposit as potash deposits go.

The geological evidence seemed to suggest that at Sneaton one might be at or near what was the shore of the evaporating sea that had produced these Upper Permian evaporites, and that rather than go still further east with our next boreholes we should go north or south of the West/East line joining E.2, E.3 and E.4. And so we decided to do both at once.

Accordingly, Eskdale No. 5 borehole was started at Eskdalegate, which is a little over a mile south-west of Eskdale No. 3 borehole at Sleights, and Eskdale No. 6 borehole was started at Upgang near the seashore between Whitby and Sandsend and 2½ miles NNE. of Eskdale No. 3. Drilling of No. 6 started on March 20, 1950, and ended on August 14, 1950. No. 5 was started on April 4, 1950, and is not yet completed.

Depth of Upper Salt

The first of these two horeholes to strike the Permian evaporite beds was Eskdale No. 6 borehole at Upgang. The top of the Upper Salt was found to be at a depth of 3778 ft. Sylvinite was encountered in a composite bed between 3867 ft. and 3895 ft., a bed made up of five bands rich in sylvite and with intervening bands of halite containing less than 10 per cent KCl. On sampling and analysis the average KCl content over the depth of 28 ft. came out at 19.6 per cent. Thus at Upgang the sylvinite bed in the Upper Salt is outstandingly thicker and richer in KCl than at either of the other two boreholes.

Below 3895 ft. the halite continued, containing only traces of sylvite, until anhydrite appeared at 3958 ft., followed by the Carnallite Marl at 3984 ft.

At Eskdale No. 6 borehole: The Middle Salt followed immediately below the Carnallite Marl at a depth of 4039 ft. There was halite for about 4 ft., and then came the first sylvinite.

It is a pity that we had to take small diameter cores at this particular place and thus were unable to get really high core recovery. Only 9 ft. came out of the 10 ft. core containing the first of the sylvinite, and only 7 ft. 6 in. came out of the next 10 ft. core. The bottom 6 ft. of this latter was halite and no more than traces of potash were present in the halite cores which followed.

At 4215 ft. streaks of anhydrite started to appear, and a little deeper bands of anhydrite alternated with halite. The core from the depths 4274 ft. to 4282 ft. consisted of very dolomitic anhydrite. It was therefore certain that the Upper Limestone was being aproached, and the further exploration of this borehole was accordingly ended.

Uncertain Analysis

Because of the incomplete core recovery in the sylvinite zone we cannot say for certain how much thicker than 7 ft. is the sylvinite bed in the Middle Salt at Upgang. We choose to infer that the missing portions of core were sylvinite, and that in fact the sylvinite bed has a thickness of 12 ft.

We cannot either be certain of the average analysis of the bed, but I can say that the average KCl content of the sylvinite cores that were recovered is 30.6 per cent. Even at the most optimistic reckoning, therefore, we must conclude that the sylvinite in the Middle Salt at Upgang is considerably thinner than at the other two boreholes.

Eskdale No. 5 borehole at Eskdalegate was started some weeks after the Upgang borehole, and progress has been considerably delayed.

What has so far been discovered about the existence of potassium chloride in the Whitby district can be fairly simply summarised. Table V states the averaged data for the sylvinite beds.

It is clear from this table that there are very considerable variations, both in thickness of the potassium-containing strata and also in KCl content.

TABLE V

Borehole	E.3 Sleights	E.4 Sneatin	E.6 Upgang
Sylvinite zone in Upper Salt—			
Thickness	22 ft.	14 ft. 4½ in.	28 ft.
Av. KCl content ...	15/18%	9.7%	19.6%
Sylvinite zone in Middle Salt—			
Thickness	31 ft.	32 ft. 10 in.	12 ft.
Av. KCl content ...	40/45%	24.7%	30.6%

Practically all our attention has been directed to finding what we can about Eskdale deposits, and much remains to be done before a detailed geological correlation with other deposits can be suggested. It has been clear from the beginning that geologically there is no connection with either the sylvinite deposits of Alsace or the sylvinite and carnellite deposits of Spain.

The real interest is in a comparison with the Permian evaporites of Germany and Russia, because the Eskdale deposits can be said like them to have been formed during periods of evaporation of an arm or arms of the Zechstein Sea.

The German potash deposits lie in two distinct fields. The more extensive is the Main Basin stretching from west of Hanover in the British Zone of Occupation to east of Magdeburg in the Russian Zone. The other deposit is in the River Werra district, in the U.S. Zone and to the south of the Main Basin, and is called the Hessen-Thüringen Basin. These two deposits are both of Permian age, but are held to be non-contemporaneous.

Comparison with Hanoverian Deposits

It is worth looking at a typical section of evaporite beds in the Hanover area shown side by side with the section of the evaporite beds in Eskdale No. 3 borehole. It is difficult to escape the suggestion that between the two sections there exists at least a superficial resemblance.

Might not the Riedal Seam of sylvinite ore correspond to the sylvinite in the Upper Salt in Eskdale, and the Ronnenberg sylvinite to the sylvinite in the Middle Salt? And might not the potash in the Lower Salt have been deposited as KCl when the KCl in the Stassfurt seam was deposited, and afterwards been converted by chemical action into polyhalite?

I am on safer ground when I turn to a comparison between the Eskdale and other potash, deposits in relation to depth, thickness of seams, form and concentration of potash salt.

The biggest known potash field is in Germany. In the Main Basin the evaporite beds are in general at such depths (about 10,000 ft.) as to be unworkable, but pressure effects, it is generally believed, on the plastic salt masses have forced up some of the beds near to the surface in the form of domes and saddles. It is the sides of these that are mined in the Hanover district, the almost vertical seams being reached by means of mine shafts varying between 2000 and 3500 ft. in depth.

At least half the material mined is sylvinite from the Riedal and Ronnenberg seams, which vary between 18 and 100 ft. in thickness, while the hartsalz of the Stassfurt seam is worked in thicknesses ranging from 6 to 132 ft. The average KCl content of the material mined differs from mine to mine, being anything from 19 per cent to 36 per cent.

We can therefore conclude that by comparison with deposits at present commercially worked in other countries the Eskdale deposits lie appreciably deeper than the deepest. On the credit side, however, we are able to set the following:—

1. There are two undoubtedly workable beds of sylvinite, and sylvinite is the easiest of the commonly occurring potash-bearing ores from which to obtain potash in a marketable form. A point I have not previously mentioned is that the sylvinite in both beds has only a small percentage of magnesium salts.

2. These two beds of sylvinite are apparently lying nearly horizontally and are not contorted steeply.

3. The upper bed of sylvinite stands comparison in both thickness and KCl content with the average of the commercially worked beds. The KCl content of the lower sylvinite is probably as good as that of any commercially worked potash bed, while its thickness is only rarely exceeded in any known potash field.

Conclusions

From the evidence so far, what conclusions can be drawn about the magnitude of the Eskdale sylvinite deposits? The data are admittedly scanty, and any estimates made now are given with all reserve.

Linking the findings from three completed I.C.I. boreholes with the evidence for the existence of potash obtained from the D'Arcy Exploration boring at Aislaby (Eskdale No. 2), it seems reasonable to consider the minimum potash-bearing area as being that enclosed within a circle on the circumference of which are Eskdale No. 2, No. 4 and No. 6 boreholes, Eskdale No. 3 being not far from the centre of the circle. The area of the circle is about 12 square miles. I want to emphasise again that the sylvinite beds are all in the region of 4000 ft. deep.

In doing a calculation to determine the total amount of KCl which these borings have uncovered, it is necessary to make a number of assumptions regarding average values and average thicknesses, and anyone biased in an optimistic direction would use bigger figures than a person of a pessimistic turn of mind.

So far as our calculation is concerned, *we cannot claim great accuracy*, but I can assure you we have endeavoured to be neither optimists nor pessimists, but realists. Our own estimate is that in the Upper Salt there are 20 ft. of sylvinite containing an average of 17 per cent KCl, and in the Middle Salt 25 ft. with an average of 32 per cent KCl. On this assumption the calculated quantity of KCl in the Upper Salt is 63.5 million tons and in the Middle Salt 150 million tons, a total of 213.5 million tons. For the purposes of forward thinking, I think we are wise if we use a figure of 200 million tons— a very appreciable addition to the natural resources of our country.

Let me add that I believe that there is in existence much more than that. We have no evidence that our boreholes all lie on the edge of the deposits. I am of opinion that I have given adequate evidence to show that we have a worth-while field worthy of being converted into a commercial undertaking.

No doubt some of you will be already turning over in your minds what is the next step to bring these deposits into commercial operation, but there I must ask to be excused from saying anything further at present. Many important things will have to be thought of—such important questions as to whether mining technique has to be used, or whether solution methods can be employed similar to brine methods—these questions can only be answered after much thought and considerable experimentation. If we assume for the purposes of our present computations that 35 per cent of the deposits can be extracted we have 70 million tons, and even assuming an annual United Kingdom consumption of 500,000 tons of KCl it would appear that we have so far uncovered enough for 140 years.

Polyhalite

My remarks have so far been concerned almost entirely with potassium chloride. I would, however, draw your attention to the obviously vast quantities of polyhalite disclosed in the Lower Salt bed by the two borings, at Sleights and Aislaby, that have so far pentrated into these strata. Polyhalite is a complex sulphate mineral containing 15 per cent of K_2O when pure, and is relatively insoluble in water.

We believe that there is at least as much potassium as polyhalite as there is in the sylvinite beds above, but we have not yet got adequate data on the characteristics of the deposits.

HEAT TRANSMISSION PROBLEMS

Work of Sheffield Research Team

WHETHER, in heat transmission methods, sufficient recourse is made in practical design to those measures which serve to close the well-known gap between the development of fundamental criteria and their use in actual practice was questioned by Professor R. J. Sarjant, principal of the Sheffield University department of fuel technology, in the course of his delivery of the 1950 Melchett lecture. There was, for example, scope for a better understanding of the significance of turbulence. Dr. S. I. Evans had given attention to the combined effect of turbulence and radiation from gaseous combustion products flowing in tubes.

An experimental arrangement was illustrated by Dr. Sarjant in two diagrams, one of which related to a recirculatory system of preheated air, and the other to the use of the direct products of the combustion of town gas with varied additions of carbon dioxide to enable radiative effects to be studied. After passing through a calming section the gases were investigated in a length of 8 ft. of actual 3-in. boiler tube, surrounded with a sectioned water calorimeter coil.

The many interesting features which had emerged from this work would be apparent in the report which would be published in the near future; meanwhile, it was interesting to note that by inserting in the tubes spiral turbulence promoters of various pitches, expressions had been obtained from which might be predicted the effect on the heat transmsson and pressure drop of a controlled pattern of turbulence.

Thus, if the path of the hot gases were defined in terms of the geometry of the spiral motion, and allowance is made for the radiation from the surface of the promoter, the increased heat transmission was a function of this increased path length according to the following expression:—

$$\frac{h^1c}{hc} = \left(\frac{G^1}{G}\right)^{0.8} = \left(\frac{\sqrt{C^2+\rho^2}}{\rho} \cdot \frac{A}{A-lb}\right)^{0.8}$$

where h^1c = heat transfer coefficient by convection with the promoter, B.Th U /sq. ft./hr. °F.

hc = ,, ,, ,, for the empty tube.

G^1, G = corresponding mass velocities, lb./sq.ft./hr

c = circumference of tube, ft.

ρ = pitch of promoter, length of one turn, ft.

A = cross-sectional area of tube, sq. ft.

l, b = cross-sectional length and thickness of promoter, ft.

A relationship was shown in terms of convection heat transfer, h_c; the pressure drop, Δp; the Reynolds number and the pitch of the promoter. The result was in keeping with observations made in the experimental combustion chamber, and was shown to be in line with fundamental theory. In the measurement of gas radiation the experimental error, by reason of the small diameter of the tube, prevented more than tentative conclusions.

In the experiments so far carried out, correlation of the results obtained with those derived by the aid of Hottel and Egbert's curves indicated that better agreement could be achieved by using as the effective mean gas temperature the logarithmic mean of the technical bulk temperatures of the gas, rather than the sum of the logarithmic mean temperature difference and the surface temperature, as used by the American authors. To settle the point, similar experiments with larger tubes were called for.

Furnace Heating Problems

In the more complicated field of furnace heating the heat transmission problems were much more complex, the boundary conditions often being more difficult to define and the character of the flow of heat was usually variable. Again, knowledge of thermal constants might be uncertain as, for example, in regard to the latent heat of materials at high temperatures, and the constants themselves might vary with temperature, as in the thermal diffusivity of steel.

The methods formerly in use included techniques based on conventional solutions of the fundamental differential equation of heat conduction[1], and more recently machine analysis[2 3]. Specialised machines were necessary for the purpose, and naturally had their limitations, although it was fortunate that there was available the first prototype of a machine based on an electrical analogy. To extend, therefore, the means of approach in some of the problems which had received attention, numerical methods of integration had been studied.

Improved techniques had been developed, and were described in a paper[4] in which his (Dr. Sarjant's) colleagues C. Hulse and P. H. Price took part. (The Third and Fifth Plant Engineering Conferences on the Design and Operation of Mill Furnaces convened by BISRA.) The principle used was based on the introduction of suitable approximations for the

differential coefficients in the basic conduction equation. This was effected by replacing them by finite differences chosen to suit the problem. The integration was then carried out stepwise in a system of intervals of temperature and time in a suitable mesh or network.

In heating practice the times of heating used had for the most part been the result of empirical trial and error. For example, in soaking pit and reheating furnace practice, little was known of the standard of temperature saturation required for a specific type of steel or condition of rolling, nor was there any certain knowledge in existence of the temperature conditions inside an ingot between casting and charging, whereby the time of testing required in the soaker could be scientifically predicted.

The methods suggested were capable of being applied to those and a multitude of other problems, where the saving of fuel could be considerable. They were also applicable in the complex problems of furnace design, a subject which was receiving both theoretical and practical attention from the Sheffield research team.

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[4] (a) R. J. Sarjant, and C. Hulse; Proc. 3rd Plant Engineering Conference, page 27 (*BISRA*, May 1949). (b) C. Hulse, P. H. Price and R. J. Sarjant; Proc. 5th Plant Engineering Conf., page 15 (*BISRA*, June 1950).

Stresses in High Pressure Plant

OPERATING conditions in high pressure plant were the subject of a paper delivered recently in Manchester by Professor D. M. Newitt, president of the Institute of Chemical Engineers, to the North-Western branch.

Discussing problems of systems condensed under pressure involving highly-stressed plant, the professor forecast the operating conditions in the future. High-pressure chemical plant, he said, was divided into two parts, the compressor and the cylindrical reactor, and the pressures were greater than the critical pressures of the substances treated. The stress in a compressor, for example, on the piston, was uniform and uniaxial; in a cylinder there were two tensile stresses and one compressive. The pressure was limited by the design either of the piston or of the cylinder.

Application of pressure to the outer wall of a cylinder was a clumsy but effective method of increasing the allowable pressure in a cylinder, but there was no remedy for a lack of strength in a piston. Theoretical work on hydrostatic pressures causing an increase in the compressive strength of materials had been confirmed and had an obvious application to the design of pistons, although a large hydrostatic pressure was necessary to make an appreciable contribution to the compressive strength.

Manning extended the theory of autofrettage to the overstrain of materials beyond the usual limit of $2\frac{1}{2}$ per cent in the bore layer of a cylinder up to an overstrain in the outer layer of the cylinder, but there was no information on the stresses on release of the overstraining pressure.

Vessels overstrained to the outer layer must have lateral support to provide stability, therefore they were conical in shape and were forced into one or several external conical sleeves for which the provision of correct angles was important.

Pressure-volume relationships with reference to reaction velocities in the liquid phase were discussed. Most liquid phase reactions were favoured by pressure, often to a degree beyond that predicted by theory. The fact that there was such an increase in the viscosity of a compressed liquid that, at 12,000 atmospheres and room temperature, the liquid behaved as a plastic solid did not alter that.

Progress at Fawley

A REPORT from the Anglo-American Oil Co., Ltd., indicates that the "peak period" has been reached in the building of Europe's largest oil refinery at Fawley, Hampshire. Over 4000 men are now engaged on the project. Among them are more than 700 pipe fitters and pipe fitters' mates and over 300 welders.

Other statistical data are on the same vast scale. Several of the main refinery units which will convert imported Middle East crude oil into 5.5 million tons of petroleum products are now structurally complete. When finished, at the end of 1951, the refinery will embody 100,000 tons of steel, 300 miles of cast iron, steel and concrete pipes, 200 miles of electrical wiring and 100,000 cubic yards of concrete.

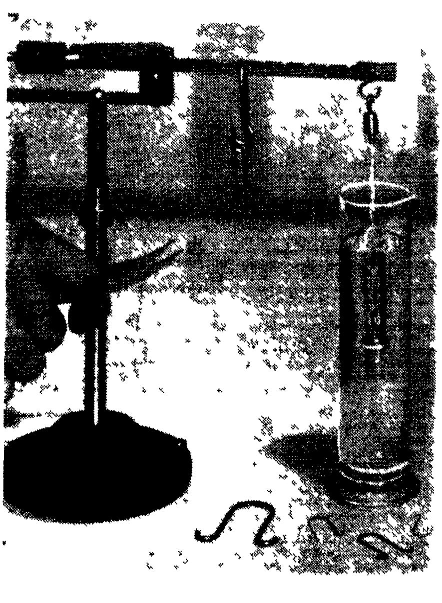
A NEW Spg BALANCE

High Degree of Accuracy

A NEW balance designed to determine the specific gravity of liquids with an accuracy to the fourth decimal place has been produced by the Central Scientific Company, Chicago, U.S.A.

Determinations are made by immersing a glass plummet of known weight and volume in the liquid and measuring the loss of weight due to the buoyant effect of the liquid. The actual weight of the plummet in air is 15 g., which includes the weight of the platinum suspension wire, and it displaces 5 g. of distilled water at 15° C. It encloses a sensitive thermometer for making temperature corrections. There are eight rider weights and a 15-gram hook weight, for use in levelling the balance.

In use, the 15 g. hook weight is suspended from the hook at the end of the beam. The balance is adjusted to equilibrium by levelling screw in the base and is calibrated by immersing the plummet in distilled water at 15.5° C. and placing a rider weight on the hook with the plummet. The reading is then of a specific gravity of one. When the plummet is immersed in an unknown liquid, the riders are arranged in the notches of the beam to bring the balance to equilibrium, and the reading is taken in the order of the largest to smallest weight, the figure on the beam indicating the integer



ELECTRON MICROSCOPY

U.S. Reduces Instrument Cost

THE availability of the electron microscope to most laboratories, schools and industrial plants in the U.S.A. is indicated by the announcement by the Radio Corporation of America of a new 30-in. high table model which will sell for less than $6000. This is about one-third the price of RCA's larger Universal model and employs permanent magnet lenses which require no adjustment. It is 20 times as powerful as the best optical microscope, its limit of resolving power being 100 Angstrom units, which is sufficient for many applications in electron microscopy. It has a useful depth of focus, to 10 microns, which is about 150 times that of the light microscope. Useful magnifications up to 20,000 diameters are provided by photographic enlargement. Direct electronic magnification up to 6000 diameters is possible, depending on the lenses employed. The accelerating potential is 50,000 volts

A time-saving feature of the new model is that specimens may be inserted into the evacuated column, or removed, without breaking the vacuum.

Promising U.S. Synthetic Enzyme

ARMOUR Laboratories, Chicago, Illinois, is undertaking an accelerated research programme to increase production and to define the usefulness of Tryptar, the brand name for the synthetic equivalent of a body enzyme, which, it has been disclosed, has the power to dissolve dead tissue and other protein in wounds and infections, without affecting living tissue. The company will undertake to manufacture sufficient quantities of the enzyme to enable selected clinics to determine the exact value of the material, which will be supplied to investigators free of charge.

Tryptar is a high purity crystalline trypsin, an enzyme produced by the body in the pancreas. It is an organic catalyst, whose function is to break up into amino acids the protein part of food.

The most promising use of the enzyme is in the treatment of tuberculosis empyema

New U.S. Sodium Cyanide Plant

A new chemical plant to be erected by E. I. du Pont de Nemours at Memphis, Tennessee, will cost $7.5 million and occupy a 225 acre site It is expected it will be completed by the end of 1951 and will employ 180 persons. Sodium cyanide will be the chief product.

Technical Publications

AROMATIC solvents which readily dissolve many types of rubbers, chlorinated rubbers, waxes, and natural and synthetic resins are described in the latest leaflet (No. 4A) issued by Petrochemicals, Ltd. These solvents 23-5, 25-7 and 23-9 are high-boiling mobile liquids obtained from the Catarole petroleum cracking process. They have a narrow boiling range, are heat and light stable and available in commercial quantities. This range of products provides excellent solvents for insecticides and herbecides such as DDT, BNC90 and pentachlorophenol. They are less dermatitic than mineral oils of similar b.p.

* * *

THE quartz plate as used for the frequency control of radio transmitters is a device requiring extreme precision in its preparation. The manufacture of such plates, especially in mass production, is an interesting problem. How the required cuts are obtained is the subject of an article by W. Parrish in "Philips Technical Review" (Vol. II, No. 11), monthly publication dealing with investigations of the Philips Industries.

* * *

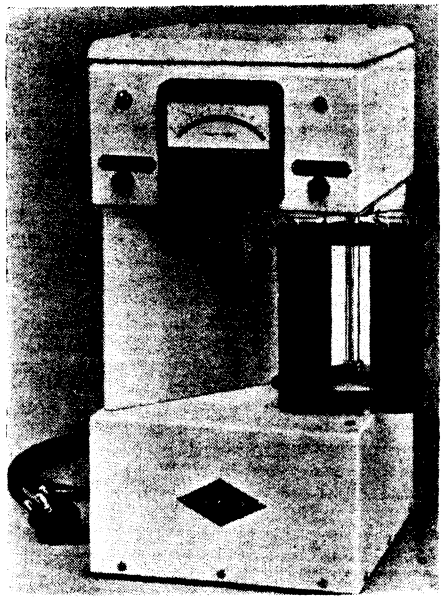
ADVANTAGES of extrusion processes are set out in the 1950 edition of "Designing with Aluminium Extrusions," an illustrated book (138 pp.), published by Reynolds Metals Co., Louisville, Kentucky. The volume is concerned with eight principles of design. An important feature of extrusions is the ability to produce parts which interlock, using dovetail, contour, snap or sliding fits for assembly. The tabular section presents 16 tables of data on chemical, mechanical and physical properties of aluminium, and extrusion process data such as minimum thickness, maximum lengths, tolerances, etc.

* * *

HISTORICAL associations of some ubiquitous metals are given in "Zinc and Spelter" published by the Zinc Development Association. These "Notes on the Early History of Zinc," by J. M. Dawkins, are said to be "compiled for the curious," but make a timely appearance when world supplies of zinc are causing some concern.

* * *

A NEW consolidated list of the imports licensing regulations at present in force (Notice to Importers No. 401) has been issued by the Board of Trade. Chemicals, drugs, medicines, dyes and colours, etc., are detailed under Group 5.



[By courtesy of Edison Swan Electric Co., Ltd.

The Filtrol photo-electric absorptiometer for the rapid routine measurement of fine suspensions and colours in liquids. Measurement is facilitated by four interchangeable colour filters

MOLYBDENUM as an alloying element forms an essential constituent of a number of special purpose and non-ferrous alloys. Its addition for increasing corrosion resistance, improving elevated temperature strength, etc., is described in "Alloy Metals Review" (Vol. 8, No. 57) published by High Speed Steel Alloys, Ltd., Widnes.

Stainless Steel for Defence

THE entire output of stainless steel containing columbium has been ordered by the National Production Authority of the U.S. Government to be set aside for the defence programme. This hard alloy is used mainly in equipment for use in chemical and industrial processes.

An order cutting the consumption of rubber was also issued by the National Production Authority. The reduction limits consumption of natural rubber to 75 per cent of the average monthly consumption in the 12 months ended June 30.

OVERSEAS CHEMISTRY AND INDUSTRY

NEW PRODUCTS AND HIGHER OUTPUTS

Fresh Progress in German Chemical and Oil Industries

THE production of most chemical products in Western Germany has undergone a further big increase since the holiday season. The demand, swelled by a genuine expansion of consumption, was raised further by replenishing of stocks, especially by buyers of dyestuffs, paints, lacquers, and soaps and washing agents. The call for basic chemicals has also increased, but not to such a marked extent.

In the export trade, great hopes are entertained for an expansion of shipments to non-European destinations, following successful negotiations with Mexico and Iran, both of which countries displayed special interest in buying German chemical products. An agreement has also been signed with Yugoslavia, but this has aroused less enthusiasm because West German exporters will have to bear part of the financial risk themselves.

Although the West German chemical firms would like to resume their traditional exchanges with East and South-east European countries, the various difficulties obstructing East-West trade have so far proved a great handicap.

Attempt to Exclude the West

Commerce with Eastern Germany is hampered by the accumulation of large West German balances on the East-West clearing account. Reports from Saxony-Anhalt make it clear that the leading chemical firms there, now all under the control of the Government or the Soviet occupation authorities, are making a deliberate effort to replace West German basic and intermediate products by substitutes of their own. The East German Government has taken steps to avoid overlapping of pharmaceutical production programmes of different factories.

The Leuna works have started the production of a number of new preparations, including Optal (n-propyl alcohol). Algamon (containing solicylamide) and Antiphytin (containing thioformol, an organic polysulphide compound). An adrenaline substitute is made by VEB Pharma factories at Dessau and Berlin. Farbenfabrik Wolfen is leading in Eastern Germany in the production of dyestuff intermediates formerly obtained from Western Germany; the substitution efforts made here have led to the production of several new blue dyes.

Under the Five-Year Plan the Leuna works is to double its motor fuel production—100,000 tons according to the latest reports—and to raise output of nitrogenous fertilisers from synthetic ammonia to 90 per cent of the total production in Eastern Germany—*i.e.*, about 210,000-220,000 tons (N) a year—by 1955.

Artificial Fibres

A very substantial increase in production is also proposed for lactams from which Perlon is made at Schwarza, Thuringia. Laboratory work on the manufacture of polyacryl-nitrile fibres is officially stated to have been almost completed; their commercial production is to be undertaken before long. Earlier work on the production of cellulose triacetate for the insulation of cables has been taken up by East German research workers and is reported to have developed to the stage at which it could be applied commercially

In Western Germany a growing number of firms report that they are able once more to supply the full range of pre-war products. Thus Röehm & Haas GmbH, Darmstadt, has regained the 1938 turnover, although some of the installations at Darmstadt were damaged in air raids, the works in the Eastern zone has been lost and a factory in the French zone is in the hands of the occupation authorities. Several new products in the field of pharmaceuticals and plastics are reported in course of development.

Farbwerke Hoechst will shortly put on the market a series of polyvinyl alcohols graded as to polymerisation and hydrolysis characteristics. Henkel & Cie., Düsseldorf, which only recently, after an interval of 11 years, reintroduced into the German market its Persil washing powder in an improved quality, is adding to its range of adhesives. The latest product in this field is Oleton, a material to impart resistance against weathering to outdoor paints. Riedel-de Haen AG, Seelze, near Hanover, has resumed the production of stearates.

The West German oil refinery output rose to a monthly average of 305,000 tons in the July-September quarter, more than

twice as much as in the corresponding period of 1949. Over 200,000 tons of crude oil more than in the April-June quarter of this year were treated. Part of the increase is due to the opening of a 600,000-ton oil refinery by BP-Raffinerie AG, a subsidiary of the Anglo-Iranian Oil Co., at Hamburg-Finkenwerder. The new refinery includes a 300,000-ton cracking plant, the biggest yet available in Germany.

Esso Standard AG, the German subsidiary of Standard Oil (New Jersey), is now operating a refinery with a throughput capacity of 560,000 tons at Hamburg-Harburg and intends to extend this to 700,000 tons a year. Construction of cracking facilities at this refinery is scheduled to begin in 1952; their prospective capacity is put at 400,000 tons.

The hydrogenation plants at Wesseling and Gelsenberg are now also dealing with substantial tonnages of crude petroleum. Cracking plants are to be erected by Erdöl-raffinerie Emsland at Lingen, Union Rheinische Braunkohlen-Kraftstoff A.G. at Wesseling, Deutsche Vacuum Oel AG at Bremen, Deutsche Erdöl AG at Heide, Holstein, and by Ruhrchemie AG at Oberhausen-Holten.

If all these projects are carried out, Western Germany will possess a cracking capacity of 2 million tons, in addition to the refinery capacity of 4.7 million tons to be reached by 1952.

GROWING EXPORT LISTS

AN examination of trade agreements recently concluded by Western Germany shows that chemical exports are again playing an important role in the country's foreign trade structure.

For instance, the new trade agreement with Poland provides for the export of chemical and pharmaceutical products valued at U.S.$4 million. Poland is to supply certain chemical raw materials, such as resin, casein for technical purposes and as medicinal herbs, valued at U.S.$320,000. It is interesting to note that Germany's proposed chemical exports rank second among main classifications of goods to be supplied, machinery coming first, with U.S.$10 million.

A one-year trade agreement with Italy envisages exports of German chemical and pharmaceutical goods worth about U.S.$5 million. The main totals in this group are (in U.S.$ thousand): creosote oils (300), sodium sulphate (100), fine chemicals (150), special solvents (450), dyestuff intermediates, including beta-naphthol (300), auxiliary products for the tanning and textile industries (150), other chemical products (600), pharmaceutical chemicals (500), pharmaceutical intermediates (200), pharmaceutical specialities (1000).

Italian chemical and allied products to be sent to West Germany includes among other materials (U.S.$ thousand): sulphur (500), borates (100), phosphorus compounds (50), tartaric and citric acids (50), celluloid (80), talcum (200), other chemicals (400), raw bauxite (200), ferro-silicon (850), colours for the glass and ceramics industries (200), glues (200), photographic gelatins (500), and shellac (50). Persia also is to receive German chemicals under a one-year trade agreement.

PAKISTAN STANDARDS

THE establishment in the near future of a Pakistan Standards Institute at Karachi has recently been announced by Pakistan authorities in London.

The Government of Pakistan, in consultation with various organisations in Pakistan and abroad, has prepared a scheme which has generally been accepted by the Provincial Governments, States, chambers of commerce and other industrial and technical organisations in Pakistan. The Standards Institute will function under the control of the Director-General of Supply and Development.

The proposal to establish a central Standards Institute in Pakistan follows from the recommendations of the First Industries Conference held in Karachi in December, 1947, which expressed the view that " the trend of modern industrial development indicates the supreme value to the country of standardisation."

The Institute will be managed by a general council consisting of representatives of the Central Government, Provinces, commercial and industrial interests in the country. It will be divided into these seven sections: Civil engineering; mechanical engineering; electrical engineering; glass and ceramics; chemical engineering; (a) chemical producing industry (sulphuric acid, caustic soda, and fertilisers), (b) chemical conversion (petroleum products, hydrogenated oils, soaps), (c) chemical processing (paper and plastics); textile and jute; packing materials.

Thus seven sectional committees will be set up to prescribe standards for their industries and also to consider the revision of standards, keeping in view the growth of industry, consumer needs and advancement of scientific technique.

OVERSEAS

Niobium Deposit

Niobium has been found in an abandoned iron mine at Fen Feild near Wefoss, Norway.

German Carbon Black?

The Hydrocarbon National Corporation of Berlin (Russian zone) is reported to be planning to manufacture carbon black from methane gas.

Nitrocellulose: Celluloid

The French *Journal Officiel* has published an Order in Council making it obligatory for plastics with a base of nitrocellulose to be declared as celluloid when such plastics contain 15 per cent or more camphor, and as gelatinised celluloid when the material contains under 15 per cent.

Petroleum By-Products

The French Standard Oil Company is now operating petroleum by-product plants in the South of France. Solvents are being produced at Marseilles and Port-Jerome, weed killers and similar products at La Meilleraye, and detergents and anti-freeze products by the Standard Kuhlmann de l'Estaque. This plant was intended to produce synthetic oils but has had to abandon production owing to difficulty in material supplies.

Polystyrene Plant for Brazil

The chemical division of Koppers Co., Inc., Pittsburgh, will co-operate with a newly organised Brazilian company, Companhia Brasileira de Plastico Koppers, in the construction and operation of a plant near Sao Paulo which will produce about 3 million lb. of polystyrene plastic annually. The new company is also to purchase from Koppers styrene monomer. Compounding and colouring of the plastic will be carried on in the Brazilian plant, which will cost about $500,000.

S. African Expansion

Industrial Chemical Products S.A. (Pty.), Ltd., Johannesburg, has completed construction of a new plant at Lilianton, Boksburg, to be used for the production of industrial, metallurgical and agricultural chemicals and various chemical specialities. The products are manufactured under American licences and patents. The new plant will replace an old factory at Booysens, Johannesburg, which the company has been operating since 1939 and, starting next month, will ultimately increase production five-fold.

Marshall Aid for Morocco

Marshall Aid funds will be used to develop the lead and zinc mines at Zellidja. Some 1400 million francs will be invested in the scheme.

Detergents to be Manufactured in Cuba

A plant for the manufacture of synthetic detergents is to be set up in Cuba by the Procter and Gamble soap organisation. The plant, for which an initial investment of approximately C$2 million has been announced, will probably be in operation by September, 1951.

Urea Plant for Japan

A modern urea plant is to be constructed in Japan by the Chemical Construction Corporation, New York. A contract covering the engineering designs has been signed with the Nissin Chemical Co., Osaka, one of the largest chemical producers in Japan.

Italian Sulphate of Ammonia Project

The Marshall Plan Administration has agreed to the construction of a sulphate of ammonia factory at Bagnoli for the Societa per l'Industria e l'Elettricita. Funds will also be provided for the construction of a synthetic ammonia plant for Montecatini which will make use of the natural gas of the Po area. Cost of these constructions will amount to $34 million of which $16 million will be provided by U.S. funds.

W. Germany's Chemical Plant Exports

According to recently published statistics, Western Germany exported in the first half of this year plant machinery and apparatus for the chemical and allied industries valued at $3.390 million, machinery for the pharmaceutical industry valued at $40,000; for the manufacture of paint, soap and candles worth $327,000 and for the rubber and plastics $805,000.

New Franco-Belgian Copper Project

The Cie. Générale d'Electrolyse du Palais has been established in Paris with a share capital of Fr. 200 million to engage in the manufacture of electrolytic copper. The new company has been formed jointly by French and Belgian mining and metallurgical interests, including the French Cie. Générale du Duralumin et du Cuivre, the Cie. Française des Métaux, and the Tréfileries et Laminoirs du Hâvre; and the Belgian Union Minière and its subsidiary, the Société Générale Mètallurgique de Hoboken. It will lease the electrolytic plant near Limoges.

PERSONAL

MR. W. M. COOPER, formerly manager of engineering of Monsanto Chemicals, Ltd., and at present assistant to the managing director, has accepted the post of assistant director of the general engineering department of the Monsanto Chemical Co., U.S.A. Mr. Cooper originally joined Monsanto as a chemical engineer at the John F. Queeny plant at St. Louis in 1935. He subsequently played a major part in the construction of the Texas City styrene plant. He joined Monsanto Chemicals, Ltd., in 1946, to form and take charge of the project engineering department which built the Newport factory.

The Melchett Medal for 1950 of the Institute of Fuel has been presented to PROFESSOR R. J. SARJANT. After graduating in chemistry, he worked with Professor W. A. Bone as his research assistant on investigations into the constitution of coal. In 1918, Professor Sarjant was appointed to the research department of Hadfields, Ltd., Sheffield, as the first fuel technologist studying specifically the fuel problems of the iron and steel industry; he became a local director of the company in 1937. He was appointed to the chair of fuel technology, University of Sheffield, in 1947.

MR. G. H. NOORDHOF has been appointed a lecturer in the department of education of the International Wool Secretariat. He has carried out research in physical chemistry for the DSIR.

MR. A. P. C. CUMMING has been elected to a Salters' Fellowship for research in chemical engineering during the year 1950-51.

The John J. Carty gold medal and award of the U.S. National Academy of Sciences go to DR. IRVING LANGMUIR, who recently retired from the post of associate director of the General Electric Research Laboratory, Schenectady, New York. He received the Nobel prize in chemistry in 1932.

Tightening Export Control

A new order by the Board of Trade requires that from October 31 molybdenum compounds and sodium azide for export to all destinations will require licences. From the same date potassium tetroxide and thallium bromo-iodide for all destinations outside the Commonwealth and the U.S.A. will also be subject to export licensing.

GELATIN & GLUE RESEARCH

THE composition of hide and the changes produced by the action of alkalis were discussed by Dr. J. H. Bowes, of the British Leather Manufacturers' Research Association, in a paper which he read at the second meeting of the research panel of the British Gelatine & Glue Research Association. Dr. Bowes dealt with recent work on the amino-acid composition of collagen, the interpretation of titration, the effect of alkaline treatment of collagen, and the swelling of collagen in alkaline solutions.

A second paper, by Mr. A. G. Ward, director of research of the association, dealt with recent studies of high polymers in relation to the properties of gelatin and glue. Methods developed for the determination of molecular weights were reviewed and their applicability to gelatin and glue were considered. Mr. Ward discussed theories of degradation of high polymers.

Obituary

DR. SAMUEL SUGDEN, professor of chemistry at University College, London, died suddenly on October 20 at the age of 58. He was educated at the Royal College of Science and became a research chemist to the Royal Arsenal, Woolwich. In 1919 he was appointed lecturer in chemistry at Birkbeck College, London. He became reader in physical chemistry at the college in 1928 and four years later professor of physical chemistry. He retained this post until 1937.

The death has occurred at Greenock of MR. ROBERT GRAHAM, Glasgow, director and manager of T. and H. Smith, Ltd., manufacturing chemists, Virginia Street, Glasgow. Mr. Graham, who was 71, joined T. and H. Smith, Ltd. as a traveller in 1900, became manager in 1919, and was elected to the board of directors in 1932. He was at one time chairman of the Scottish Wholesale Druggists' Association.

The death was reported last week of PROFESSOR RICHARD STANFIELD at his home in Edinburgh at the age of 87 years. He was recognised as an authority on heat engines. At the early age of 26, the professor was appointed Professor of Engineering at the Heriot-Watt College, Edinburgh, a post which he retained until he retired in 1929. He was largely responsible for the lay-out and design of the engineering laboratories in the college.

HOME

Cheaper Platinum

The price of platinum in London on October 18 was reduced to £27—£33½ an ounce.

Dearer Copper Sulphate

The export price of U.K. copper sulphate was raised on October 18 by £2 12s. 6d. to £62 15s. per ton f.o.b. This increase is the fifth within a few weeks.

Highest Coal Output Since May

Production of coal in the U.K. last week was 4,878,400 tons compared with 4,335,500 tons in the previous week. Although this was the highest output since the week ended May 20, it was below the figure for the corresponding week of 1949.

Steel Prices Amended

A Ministry of Supply order amends the maximum prices of a limited range of iron and steel products from Tuesday this week. Principal increases are in the maximum prices of quenched rods and upholsterers' spring wire.

Tax Relief for Perfumery Materials

The Commissioners of Customs and Excise, after consultation with the trade associations, have decided that concentrated perfumery essences (either simple or mixed), which are free from vehicle or diluent such as ethyl alcohol, shall not be chargeable with tax unless put up for toilet use. This relief will apply also to floral absolutes and floral concretes supplied in the same conditions.

Southport Oil Search Continues

The D'Arcy Exploration Company, which has been exploring Southport foreshore for oil, on October 20 asked a corporation committee for permission to make two borings, one at Ainsdale and the other at Birkdale. They told the committee that they are sure there is oil near where borings are proposed, and that the bed may extend seawards. Drilling, if allowed, will continue until next Spring.

Duty on Light Oils

Proposals which have been submitted to the Treasury are intended to overcome the administrative difficulties said to have prevented a remission of the tax on the light hydro-carbon oils. This was announced at a meeting of the industries concerned held in London last week. It was also agreed to continue pressure for the removal of the tax and to seek an interview with the new Chancellor of the Exchequer.

Cheaper Wolfram

Quotations for wolfram were lowered by 5s. on October 17 to 230-240s. per unit.

New Scottish Sales Office

A new sales office in Glasgow to handle all its products in Scotland has been opened by F. W. Berk & Co., Ltd. The address is 65 West Regent Street, Glasgow, C.2. Telephone: Douglas 8338.

Grecian Chrome Ore

The Ministry of Supply announces that Grecian chrome ore is now available in refractory 1st quality, basis 40 per cent at £11 15s. 6d. per ton delivered *ex*-ship and £12 13s. 6d. *ex*-store.

New Dundee Laboratories

The chemistry department of Dundee University College has been redesigned and extended to cover a wider range of industrial chemical investigation. The new laboratories were officially opened last Monday.

Aluminium Export Licences

The Board of Trade announced last Monday that from October 27 individual export licences will be required for the export of aluminium or aluminium alloy goods valued at less than £180 per ton, compared with £150 announced on July 5.

Labels No Longer Taxable

The Treasury has exempted from liability to purchase tax labels, tags, gummed seals and other marking tickets. The exemption applies to such articles, whether unprinted, partly-printed or fully-printed and whether made of paper, fabric, metal, plastic or other material.

Tin Touches £918

New records for tin were established during the week on the London Metal Exchange, cash prices reaching £888 a ton on October 18, rising a further £8 10s. on October 19 and attaining a new peak of £918 a ton on October 24, cash price in the closing session being £914-£916. The extreme scarcity of immediate supplies was again manifest.

Steel Mill Records

Two new records in steel production have been set up by the Lanarkshire Steel Company in their mills at Motherwell. In one week the rolling mill turned out 5138 tons of steel. The previous record, set up in April, was 5050 tons. The cogging mill's output, 6206 tons, was also a record. The company is one of the 92 scheduled for nationalisation in February next year.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.)

DURAZONE CO., LTD., London, N., chemical manufacturers. (M., 28/10/50.) September 27, debenture, to P. P. Rodoacanachi & Co., London; general charge. *Nil. July 31, 1949.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 28/10/50.) September 29, £1000 debentures, part of a series already registered. *Nil. July 22, 1949.

INDUSTRIAL SALVAGE, LTD., London, W. (M., 28/10/50.) September 25, £3000 (not ex.) debenture, to M. W. Dennes, Shipham and others; general charge. *Nil. October 12, 1948.

JEWELL PLASTICS, LTD., Sandwich. (M., 28/10/50.) September 26, £3000 debentures; general charge.

PARTINGTON INDUSTRIAL ESTATES, LTD., London, W. (M., 28/10/50.) September 19, mortgage (supplemental to a trust deed dated May 17, 1949, securing secured loan stock of Petrochemicals, Ltd.) securing an amount equal to the aggregate of all moneys then owing by the company to Petrochemicals, Ltd., plus £75,000; charged on land and buildings at Carrington, with fixed plant, machinery, etc.; also September 19, mortagage (supplemental to a trust deed dated December 30, 1949, securing second secured loan stock of Petrochemicals, Ltd., and a premium of 5 per cent) securing an amount equal to the aggregate of all moneys then owing by the company to Petrochemicals, Ltd., plus £75,000; charged on land and buildings at Carrington, with fixed plant, machinery, etc. *£4,300,000. January 13, 1950.

PETROCHEMICALS, LTD., London, W. (M., 28/10/50.) September 19, mortgage supplemental to a trust deed dated May 17, 1949; charged on Victoria College, Eccles, fixed plant, machinery, etc., and certain shares; also September 19, mortgage supplemental to a trust deed dated December 30, 1949; charged on Victoria College, Eccles, fixed plant, machinery, etc., and certain shares. *£4,300,000. May 28, 1950.

D. RILEY, LTD., Liverpool, chemists. (M., 28/10/50.) September 22, charge, to Barclays Bank, Ltd., charged on 65 William Henry Street, Everton. *Nil. Aug. 4, 1949.

TOOL TREATMENTS (CHEMICALS), LTD. (formerly PROPERTY OWNERS' MUTUAL SERVICES, LTD.), West Bromwich. (M., 28/10/50.) September 29, £1070 debenture, to County Estates (Derby), Ltd.; general charge.

Increases of Capital

The following increases of capital have been announced: LIFEGUARD PRODUCTS, LTD., from £10,100 to £40,000; VALENTINE WOOD, LTD., from £100 to £2000; ASHILL DISTRIBUTORS CO., LTD., from £15,000 to £40,000; HAPPE PRODUCTS, LTD., from £25,000 to £30,000; ARTHUR H. COX & CO., LTD., from £60,000 to £150,000.

Company News

The Ketton Portland Cement Co., Ltd.

Profit for the year of the Ketton Portland Cement Co., Ltd., was £71,332 (£72,648 a year ago). Profits tax and income tax accounted for no less than £101,575. This item exceeded the available net profit by £30,000. A final dividend of 10 per cent on the ordinary shares is proposed, making 15 per cent for the year, with a bonus of 2½ per cent on the ordinary shares. A balance of £99,780 is carried forward.

Light Metal Tools

MINISTRY of Supply statistics relating to U.K. production, imports and consumption of light metals in August include the following (in long tons):—Virgin aluminium: production 2353, imports 9996. Secondary aluminuim: production 6904. Aluminium scrap arisings 7381, consumption 9087. Aluminium fabrication 15,748, foil 847. Magnesium fabrication 307. Production and imports of virgin aluminium were both less than a year ago when the figures were, respectively, 2571 and 20,418.

New Companies Registered

Charles Bedeman, Ltd.
Private company. (485,760). Capital £1000. Manufacturers of detergents, emulsions, disinfectants, etc. Directors: C. N. Bedeman, 11 Lindsay Road, Hampton Hall, Mdx.; and L. W. Romp, 122 Peckham High Street, S.E.15. Reg. office: 122 Peckham High Street, S.E.15.

Chemicals and Plastics, Ltd.
Private company. (486,416). Capital £200. Importers, exporters and manufacturers of metals, chemicals, gases, plastics, etc. Directors: Pablo B. Bataller (Barcelona) and Mrs. Helen M. Weitzkorn. Reg. office: Imperial House, Dominion Street, E.C.2.

T. Dryden, Ltd.
Private company. (486,779). Capital £15,000. To acquire the business of a dealer in chemicals, acids and scientific apparatus and a laboratory furnisher carried on by Thomas A. Dryden at Landore, Swansea, as "T. Dryden." Directors: Thomas A. Dryden, C. A. Dryden and A. E. Dryden. Reg. office: Greenfield Chemical Works, Landore, Swansea.

Euxton Seals, Ltd.
Private company. (486,855). Capital £500. Manufacturers, producers and designers of stoppers, corks, sealings, closures, discs, etc. Directors: J. C. Watkinson and D. Ashworth. Reg. office: 109a Eldon Street, Preston.

Hundred Percent Chemical Products Co., Ltd.
Private company. (485,838). Capital £100. Exporters, importers and manufacturers of chemical materials and products used in the motor and engineering trades, degreasers, etc. Directors: H. W. C. Airey, and R. H. Stevens. Reg. office: Rex House, 38 King William Street, E.C.4.

Jones Lane & Co., Ltd.
Private company. (485,448). Capital £5000. Colliery proprietors, exporters and importers of coal and salt; dealers in petroleum and other mineral oils, etc. Subscribers: A. G. Jones, 8 Sutherland Avenue, Orpington, Kent, and Chas. J. S. King, St. Ermins, S.W.1. Reg. office: 16 Catherine Place, S.W.1.

Keystone Chemicals (Ireland), Ltd.
Private company. (13.521). Capital £100. Chemical manufacturers, agricultural, pharmaceutical and industrial chemists, etc. Subscriber: H. W. Fey, 83 Victoria Road, Rathgar, Dublin, manager.

Paul V. Kutiak Co., Ltd.
Private company. (486,967). Capital £110. Importers, exporters, manufacturers and dealers in chemicals, oils, spices, textiles, furs, plastics, ferrous and non-ferrous metals etc. Directors: Paul V. Kutiak and Mrs. Sonia Kutiak. Reg. office: 30, York Avenue, London, S.W.14.

Mersol Manufacturing Co., Ltd.
Private company. (486,647). Capital £500. Manufacturers of cleansing materials and compounds, detergents, bleaching powders, etc. Directors: K. G. Cleminson and A. E. Cramp. Reg. office: Cliffe Works, Rugby Road, Leamington Spa.

Metalconomy, Ltd.
Private company. (486,504). Capital £100. Manufacturers of chemicals for paints, varnishes, anti-oxidants, passivators, metal treatment, etc. Directors: L. P. K. Oldale and A. E. Rabin. Reg. office: 67 Moorgate, E.C.2.

Metcalf Waring & Co., Ltd.
Private company. (485.287). Capital £5000. To acquire the business of chemical manufacturers carried on by Metcalf & Co. at Miles Platting, Manchester, and to carry on the business of pitch manufacturers and blenders, cable and mineral wax manufacturers, etc. Directors: K. Waring, C. R. Metcalf, and J. Prior. Reg. office: Victoria Chemical Works, Clifton Street, Miles Platting, Manchester.

Micafine, Ltd.
Private company. (487,130). Capital £200,000. Processing mica and other minerals, ores and deposits and by-products, etc. Solicitors: Grundy Kershaw & Co., 31 Booth Street, Manchester.

Organic Dyestuffs (Exports), Ltd.
Private company. (486,884). Capital £1000. Manufacturers of dyestuffs, pigments, chemicals, etc. Directors: R. H. Rylatt and T. Rylatt. Reg. office: Loyal Arcade, 76 Mostyn Street, Llandudno.

Produce Supply Co. (Glasgow), Ltd.
Private company. (27,925). Capital £100. Analytical and consulting chemists, etc. Subscribers: B. Corner and J. M. Balfour, 172 St. Vincent Street, Glasgow.

A. L. Smith (London Road), Ltd.
Private company. (486,672). Capital £2000. Consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: A. L. Smith and R. W. Addy. Reg. office: 85 London Road, Coventry.

Next Week's Events

SATURDAY, OCTOBER 28

Electrodepositors' Technical Society

London: Hyde Park Hotel, Knightsbridge, S.W.1. 7 p.m. until midnight. Dinner Dance.

MONDAY, OCTOBER 30

Pharmaceutical Society of Great Britain

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. "The Society's Educational Policy." C. W. Maplethorpe, Ph.C.

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. F. W. Mills: "Steam."

TUESDAY, OCTOBER 31

Royal Institute of Chemistry

Leeds: University, 6.30 p.m. (With the University Chemical Society). Dr. D. W. Kent-Jones: "Why Flour Improvers Are Used. The Agene Problem."

Hull Chemical & Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. H. Kay: "Ultramarine."

Society of Instrument Technology

London: Manson House, Portland Place, W.1, 6.30 p.m. A. R. Aikman: "The Frequency Response Approach to Automatic Control Problems."

WEDNESDAY, NOVEMBER 1

Royal Institute of Chemistry

Newport: (with SCI). H. A. Vodden: "The Scattering of Light by Small Particles and Some Applications to Colloid Chemistry."

Institution of Electrical Engineers

Middlesbrough: Cleveland Scientific and Technical Institute, 6.30 p.m. D. B. Hogg: "Some Notes on Electrical Installations in Large Chemical Factories."

British Association of Chemists

Liverpool: Radiant House, Bold Street, 7 p.m. Short illustrated lectures.

Society of Public Analysts and Other Analytical Chemists

London: Burlington House, Piccadilly, W.1, 7 p.m. W. Westwood: "Chemical Determination of Magnesium in Cast Iron"; W. McCamley, T. E. L. Scott and R. Smart: "Determination of Sodium in Aluminium and its Alloys by Vacuum Distillation"; R. M. Black: "Determination of Lead Oxide in the Presence of Lead."

British Ceramic Society

London: 90 Buckingham Palace Road, S.W.1. Two-day autumn meeting of the Refractory Materials Section. Chairman: W. Boyd Mitchell.

THURSDAY, NOVEMBER 2

The Chemical Society

Bristol: University, 7 p.m. (Joint meeting with RIC and SCI). Dr. J. S. Anderson: "The Hahn Emanation Technique."

London: Burlington House, Piccadilly, W.1. Symposium: "Tropolones and Allied Compounds," introduced by Prof. J. W. Cook. Afternoon session: 2.30 p.m., evening 7.30 p.m. Among the papers delivered will be "Thujaplicins," by H. Erdtman and "Ultra-violet Absorption," by Mrs. G. Aulin-Erdtman of Stockholm.

Nottingham: University, 6.30 p.m. (With the University Chemical Society). Prof. C. W. Shoppee: "The Cortisone Problem."

Royal Institute of Chemistry

Brighton: Technical College, 7 p.m. D. Mahon: "The Nature of Plastics" (with film).

Liverpool: University, 7 p.m. Dr. J. B. Firth: "Some Applications of Science in the Detection of Crime."

Society of Chemical Industry

Nottingham: Gas Showrooms, 7.15 p.m. J. N. Fears: "Brown *v.* White Bread."

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. W. K. Burton and N. Cabrera: "Equilibrium Structure of Crystal Surfaces"; W. K. Burton, N. Cabrera and F. C. Frank: "A Theory of Growth of Real Crystals."

Institute of Metals

Birmingham: James Watt Memorial Institute, Great Charles Street, 6.30 p.m. "Refractories."

Leeds Metallurgical Society

Leeds: University, 7 p.m. "Modern Welding Practice."

Liverpool Metallurgical Society

Liverpool: City Technical College, Byrom Street, 7 p.m. H. G. Taylor: "Recent Work of the British Welding Research Association."

Mineralogical Society

London: Burlington House, Piccadilly, W.1, 5 p.m. Papers include: K. Norrish: "Priderite, a New Mineral from the Leucite Lamproites of the West Kimberly Area, Western Australian"; and Dr. G. F. Claringbull: "New Occurrences of Duftite."

(continued at foot of next page

Chemical and Allied Stocks and Shares

BUSINESS in stock markets has been well maintained and prices have again shown an upward trend. British Funds have been active on the terms of the latest gilt-edged issue and a number of surprise dividend increases helped sentiment in the industrial sections. It is not expected that the new Chancellor of the Exchequer will relax the dividend limitation request. Sentiment in the industrial sections tended to be affected by the new Chancellor of the Exchequer's indication that, as a result of rearmament demands, direction of labour and allocation of raw materials may again have to be re-imposed.

Reflecting the better trend in markets, chemical and kindred shares have been firmer and generally rather more active, although in most cases prices movements have been small on balance. Imperial Chemical were firm at 42s. 7½d., Monsanto 10s. shares 51s., and Fisons moved up to 28s., being helped by hopes of a dividend of 9 per cent, on which basis there would be an attractive yield. Albright & Wilson remained at 30s., Boake Roberts at 31s. 6d. and Brotherton 10s. shares at 20s. 6d. Amber Chemical 2s. shares were 2s. 9d., F. W. Berk 11s. 9d., Bowman Chemical 5s. 3d., Pest Control 7s. 4½d., Laporte Chemicals 5s. units 10s. 4½d., and Lawes Chemical 10s. shares 10s. 6d.

British Oxygen have eased to 90s. 6d. on the big new issue, although the market believes there are excellent prospects of the dividend being maintained in future despite the larger capital. Turner & Newall have been active around 85s. on continued market hopes of higher dividend possibilities. United Glass Bottle showed firmness at 76s. 3d. and Triplex Glass have been active around the higher level of 28s. There was a sharp advance in Dunlop Rubber to 65s. 3d. Lever and Unilever debentures touched the new high level of 30s. premium and the ordinary units were steady at 44s.

The 4s. units of the Distillers Co. were active around 19s. 7½d. United Molasses were firm at 47s. and British Glues strengthened to 21s., after easing, and closed on 20s. Despite the record profits and raising of the dividend from 8 per cent to 10 per cent, British Celanese shares came in for profit taking and eased to 24s. 6d. Calico Printers remained active and higher on the good results announced, with the increased payment of 12½ per cent against the previous year's 8 per cent. Courtaulds at 41s. 8d. were active on talk of higher dividend possibilities.

Iron and steels remained generally steady although not active. Shares of companies not under the nationalisation threat tended to move higher, Guest Keen, for instance, were 46s. 6d., and Babcock & Wilcox 64s. 9d.

Glaxo Laboratories were higher at 58s., De La Rue steady at 24s. 6d., Kleeman 1s. shares 10s. 4½d. and British Industrial Plastics 2s. shares 6s. 1½d. Boots Drug showed firmness at 49s. Borax Consolidated at 55s. were well maintained, and British Aluminium eased slightly to 44s. 3d. Associated Cement at 84s. 3d. also failed to hold best levels. Pinchin Johnson and Goodlass Wall, at 42s. 9d. and 37s. 9d. respectively, were well maintained. Oils turned uncertainly, Anglo-Iranian being slightly lower at £6 10s. and Shell 64s. 4½d.

NEXT WEEK'S EVENTS

(continued from previous page)

FRIDAY, NOVEMBER 3

The Chemical Society

St. Andrews: University, 5 p.m. (With the University Chemical Society). Professor J. N. Davidson: "Chemical Aspects of the Cell Nucleus."

Royal Institute of Chemistry

Stockton-on-Tees: William Newton School, Junction Road, Norton, 7.30 p.m. Professor F. A. Paneth: "Meteorites."

Society of Chemical Industry

Glasgow: Royal Technical College, George Street, 7.15 p.m. Dr. T. Currie: "Ion Exchange Materials."

Pharmaceutical Society

Hull: Imperial Hotel, 8 p.m. Dr. E. Lester Smith: "Vitamin B_2—Recent Developments."

SATURDAY, NOVEMBER 4

Royal Institute of Chemistry

Reading: University, 2.30 p.m. Dr. D. W. Scott Blair: "Recent Developments in Rheology."

Institution of Chemical Engineers

Manchester: Reynolds Hall, College of Technology, 3 p.m. C. G. H. Hands and F. R. Whitt: "Glass Lined Equipment Used for the Preparation of Organic Compounds"; E. Barton and Miss E. V. Williams: "Experimental Determination of Jacket Film Heat Transfer Coefficients for Merrill Oil, Dowtherm and Tetracresyl Silicate."

Prices of British Chemical Products

Competitive Conditions in the Home and Export Markets

FAIRLY brisk trading conditions continue generally on the industrial chemicals market, with a good demand for most items for both home and export use. Buyers are giving increasing attention to forward contracts and in consequence spot supplies are likely to become more difficult. There have been no further important price changes at the time of this report but the general tone of the market is strong and further price adjustments would not be unexpected. Makers' deliveries of the routine soda compounds have been well maintained and offers of the potash products are being fully absorbed. Arsenic, hydrogen peroxide and formaldehyde are items in good request. There has been no change in the firm conditions of the coal tar products market and no improvement in the drums supply position which is becoming a serious obstacle to export trade.

MANCHESTER.—The Manchester chemical market maintains its firmness in almost all sections and there has been a fresh advance in sulphate of copper to £62 15s. per ton, f.o.b. Home-trade consumers of the alkalis and other leading lines are specifying for good deliveries and a fair amount of replacement buying covering a wide range of products has been experienced during the past few days. Fresh inquiries from shippers have also been on a fair scale. A quietly steady business has been placed in fertilisers and most of the tar products continue to be taken up in fair quantities.

Price Changes

Rises: Acetic acid, acetic anhydride, industrial alcohol, ammonium persulphate, amyl acetate, antimony oxide, arsenic, butyl acetate butyl alcohol, citric acid, copper carbonate, copper sulphate, ethyl acetate, methylated spirit, tartaric acid, zinc oxide, lithopone, cresylic acid, compound fertilisers.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £69; 80% pure, 1 ton, £74; commercial glacial 1 ton, £82; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £118 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 5d. per proof gallon; 5000 gal. lots, d/d, 2s. 6½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £47 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER: £5 2s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £179 10s. per ton.

Antimony Oxide.—£200 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4½d. per lb. Crimson, 2s. 6½d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£156 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£143 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 7d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 2s. per lb.

Copper Chloride.—(63 per cent), d/d, 2s. 2d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63 per cent), d/d, 2s. 1d. per lb.

Copper Sulphate.—£60 2s. 6d. to £62 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £114 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1260 s.g. 128s. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—21s. per lb.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—Nominal.

Lead Carbonate.—Nominal.

Lead Nitrate.—Nominal.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £146; orange lead, £158. Ground in oil: red, £166; orange, £178.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £153 10s. per ton. Ground in oil: English, under 2 tons, £170 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d. £22 to £25 per ton.

Litharge.—£146 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £74 5s.; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial d/d, £187; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton

Mercuric Chloride.—Per lb., lump, 8s. 5d.; smaller quantities dearer

Mercurous Chloride.—9s. 4d. per lb., (28 lb. lots).

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 2d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 4d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £63 10s. per ton; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 15s. 5d. per lb.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—160° Tw., £6 16s. to £7 16s. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £9.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £142; green seal, £141; red seal, £139 10s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb , according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5⅝d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £44 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 11s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £20 1s. 6d.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5½d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 10⅞d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 11⅝d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6½d. to 9⅞d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9⅞d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, American, duty free, 7s. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 110s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: October 23. The prices of all refined oils and imported edible animal fats remain unchanged for the eight-week period ending December 2. The prices of all unrefined oils and fats and technical animal fats remain unchanged during the five-week period ending November 4.

Less Copper for Sulphate

THE probability that shortage of scrap copper, much of which was being used for ingot production and rearmament, would enforce a reduction of copper sulphate production and exports, was foreseen by Mr. J. D. McKechnie, chairman of the British Sulphate of Copper Association, Ltd., at the 26th annual general meeting in London on Wednesday. He disclosed that total exports for 1949-50 were 43,391 tons, as compared with 34,988 tons in the previous year.

British Plant for India

MR. R. E. G. WINDSOR (R. H. Windsor, Ltd., plastics machinery manufacturers, London) is now on a brief visit to India for the study of the plastic requirements of the large market there. He is also expected to visit Pakistan on the completion of his tour of India. The company now has a branch office in Bombay under the name of R. H. Windsor (India), Ltd., and a London-trained expert is already in Bombay to take charge of the servicing department. The next step will be the manufacture of moulds according to the requirements of Indian manufacturers. The last stage will be the manufacture of machines in India itself.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

THE INSTITUTION of CHEMICAL ENGINEERS

EXAMINATION, 1951

Application forms, (returnable 1st December, 1950) and particulars of the Associate-Membership Examination for 1951 may be obtained from the Hon. Registrar, **INSTITUTION OF CHEMICAL ENGINEERS, 56, VICTORIA STREET, WESTMINSTER, LONDON, S.W.1.**

SITUATIONS VACANT

CHEMICAL ENGINEER required for old-established London Firm of Chemical Engineers. University Degree, A.M.I.Chem.E or equivalent, and experience in Heavy Chemical Industry, especially design or operation Sulphuric Acid Contact Plant, desirable but not essential. Salary according to qualifications and experience. Pension Fund. Write, Box No. C.A. 2955. THE CHEMICAL AGE, 154, Fleet Street, London, E.C 4.

CHIEF RESEARCH CHEMIST. Heavy organic chemical manufacturing company need a Chief Research Chemist to take charge of expanding research department. Appropriate experience is essential and the salary will be £1,500 or over according to applicants ability and qualities. A suitable house will be made available if necessary. Reply to Box No. C.A. 2954, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

THE CIVIL SERVICE COMMISSIONERS invite applications from **MECHANICAL ENGINEERS** for a permanent appointment in the grade of **DEPUTY CHIEF SCIENTIFIC OFFICER,** at a Research and Development Establishment near London, to take charge of all the engineering groups in the Establishment. The duties include the general supervision of mechanical engineering workshops, mainly of the tool-room type, electronics workshops and design and drawing office sections, as well as the site maintenance of a variety of engineering services. The function of the design and drawing office sections is to provide a wide range of mechanical and electronic equipment and apparatus for use in the research, development and prototype-plant sections of the Establishment, some of which are chemical engineering in character.

Candidates must have been born on or before August 1st, 1919, and have First or Second-Class Honours Degree in Mechanical Engineering or equivalent qualification, together with suitable first-class practical experience.

Salary scale (male), £1,750-£2,025. Rates for women somewhat lower. Post carries benefits under Federated Superannuation System for Universities.

Housing accommodation will be available for the selected applicant.

Particulars and application forms from the **Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London, W.1, quoting No. 3324.** Completed application forms must be returned by November 16th, 1950.
8783/120/WP

FOR SALE

VARIOUS MIXERS FOR SALE

BAND CONVEYOR, 50 ft. long 40 in. wide, steel frame, motorised, for boxes, cases, bags, etc.

A FILTER PRESS, 31½ in. square, fitted with 42 C.I. plates, centre fed.

FILTER PRESS, 25 in. square, fitted with 24 plates, cast iron built and steam heated.

Four **GARDNER HORIZONTAL MIXERS,** for powders, from 100 lbs. to 250 lbs. capacity, all motorised, three with Radicon Reduction Gear Boxes and one with a Spur Gear Drive.

Two large unjacketed **WERNER MIXERS,** belt and gear driven, hand tipping, double " Z " arms, pans 53 in. by 45 in. by 36 in. deep.

No. 200 One nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR.** Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double " U "-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double " U " type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double " Z " mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL " U "-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three " U "-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application.

Write RICHARD SIZER LIMITED, ENGINEERS, CUBER WORKS, HULL

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4

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Anglo-American Abstracts?

A PROMISING proposal to simplify the formidable task of keeping abreast of the literature, which for many means reading at least American abstracts as well as the numerous publications of our own, is securing serious attention here and in the U.S.A. The proposal, by L. M. Miall in the form of a letter to the chemical Press (*Chemistry and Industry*, Sept. 5), has the virtues of simplicity and of complementing other contemporary policies reflecting the closer identification of British and American interests in technical and scientific affairs. It recommends a coalition between the British Abstracts Bureau and the American Chemical Society in the production of an Anglo-American abstracts service. The onerous responsibility of combing at least two wide fields of literature—often as a "spare time" activity—is not peculiarly a British problem. That is recalled by the fact that the argument has now been reproduced in the American *Chemical and Engineering News* (28, 3291).

Mr. Miall stresses the melancholy fact that both abstracting bodies, in this country and in America, are working at a heavy loss and in 1949 a deficit of £13,500 in Great Britain and $246,076 in the U.S.A.—despite some stringent economies; and there is rapidly increasing difficulty in finding competent staff numerous enough to deal with the great mass of chemical and allied literature. That obdurate problem has been made all the harder to resolve by the great extension of research since it was "demobilised" and the corresponding proliferation of the literature, periodicals, patents, reports and miscellanea. The increased activity in all kinds of abstracting and information services by individual firms and organisations, has led to a deplorable amount of overlapping so that the overwhelmed chemist and the high cost of classified summaries both plead for relief.

The American and British abstracts, as Mr. Miall has pointed out, cover much the same ground, and there is a tendency by firms to use one or the other, but not both. In addition to the two national abstracting services there are, of course, others, more or less sectional, including the joint or co-operative undertakings of the metallurgical and electrical engineering and physics bodies, respectively, both of which touch applied chemistry at many points. It is one of the primary duties of the scientific and technical associations to give members a competent information and abstract service, and many large firms, having their own independent abstracting and library

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d ; post paid, 1s.; SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

staff, use outside abstracts to check and amplify their own work. The difficulties have been discussed, at ASLIB conferences and elsewhere, almost *ad nauseam*.

The main question now is the possibility of some form of international collaboration, of which an Anglo-American alliance may be the first step. There are plenty of precedents in the technical-scientific field for such collaboration in other forms. Its extension to the abstracting realm may indeed become unavoidable if costs and other difficulties continue to multiply. For the average chemist and for most chemical firms the desideratum will be the capacity of a combined abstracts service to give a better and especially a quicker survey at a lower cost. Another important consideration would be the accuracy of assessment of the value of the material offered. U.S. Chemical Abstracts claims that its survey covers more than 5000 periodicals, but quantity is certainly not the best criterion. The great modern increase in the volume of published material has not been accompanied by an equivalent improvement in quality.

It is incontestable that the value of information is doubled if prompt, yet the time lag before some work appears in abstract form is occasionally preposterous. There have been many instances when the interval has amounted to more than two years. It should not be particularly hard, with British and American organisation, to avoid delays of anything like that magnitude.

Whether mechanical aids in library and information work will help to ease the problems which crowd in this particular field is another matter, but is of almost equal interest. There have been remarkable claims during the past year or two. The "Whirlwind documentary engine" or Doken, described at the last meeting of the American Chemical Society by C. M. Mooers, of the Zator Company, was at all events a possibility, even if it has not been realised. That "would be able to search the entire Library of Congress in 10 seconds, select all information on a given subject, and print selected abstracts at the rate of 10 per minute". Another, described at the same meeting by Mr. Coile, of the Massachusetts Institute of Technology, is an extention of the pre-war Vannever Bush "Rapid Selector". These, however, are still visions. Mr. Miall's plan is on a substantially more practical plane. It calls only for intelligent co-ordination of what we have already.

Notes and Comments

Chemists' Productivity Team

WITH the departure on Wednesday this week of the first team from chemical industry to study some aspects of American production methods a new stage, and potentially the most promising, is reached in the series of exchanges sponsored by the Anglo-American Council on Productivity. Judging by the reserve shown by the Productivity Council and others concerned with securing the invitation from the U.S. drugs and pharmaceutical industry—which has at the moment more to impart than any equivalent body outside this country—the negotiations have not been easy. The extent to which the engaging "open house" hospitality shown to others among the 82 teams which have made similar tours will be extended to the chemical team is still subject for speculation. The terms of reference are not too clearly defined, possibly because much will depend upon the communicativeness or its reverse of the various host industries. If, as seems likely, the Englishmen will have to confine themselves to a study of the latter stages of processing of pharmaceutical products and their packaging the experience may still prove to be of the utmost value. Those aspects alone comprise quite enough subject matter to occupy experts very much longer than the short duration of the team's programme in the U.S.A. The use of labour saving methods of final processing and packaging is fortunately a theme which British experts are well qualified to study with critical appreciation, having themselves achieved some remarkable accelerations, such as the Cellophane packaging of penicillin cartons at the rate of 30—instead of three—a minute.

Achievements in Adversity

THE British delegation, in meeting their American counterparts in the next few days, need have no reason to feel diffident about their own achievements, and not merely in such things as mechanical techniques. Theirs is, in fact, one of the very few industries whose almost spectacularly progressive research departments still operate without outside help of any kind, official or otherwise. American respect for sturdy private enterprise will probably appreciate more fully than it is appreciated here the force of one observation made at the recent general meeting of the Association of British Pharmaceutical Industry. It drew attention to the immense amount of unaided pharmaceutical research carried on by private enterprise here, and affirmed that the industry was, in fundamental discoveries, on equal terms or ahead of its foreign competitors. Meanwhile it was being handicapped in developing its research by the numerous restrictions imposed on industries and the most onerous burden of taxation imposed anywhere. The Americans, if asked, could no doubt proffer what would seem to them a simple solution of those problems.

Tin and Aluminium

THE disagreeable foretaste which tin has provided of the runaway prices which the essential metals so readily attain when buying is spurred on by eagerness to secure supplies ahead has enforced some anxious speculation regarding the future status of other categories in the non-ferrous group. Tin's rise to little short of a thousand pounds a ton (£980 on Wednesday) in the course of an ascent which has lasted several weeks has underlined the hazards and current costing perplexities of many non-ferrous metal users. It has also invited some anxious speculation on the part of the very much more numerous buyers of the other metals, of which aluminium is gaining prominence, partly because it is so conspicuously a strategic material. News from all over the world tends to confirm the same story—that all the widespread schemes to increase aluminium production capacity may

not keep pace with the mounting demand, which moves much faster than reduction plants can materialise.

America's " Immense Demand "

THE great expansion of production which the possibility of aluminium shortage has stimulated in North America holds little prospect of relieving the situation here should the anticipated shortage of aluminium for domestic production develop. Added to the shortage of Canadian dollars is a new factor which may prevent our making fuller use of the growing Canadian sources of the metal —the confident expectation that the U.S.A. will monopolise most of the increase. Canadian authorities, having just authorised a hydro-electric development requiring $30 million for the Aluminium Company of Canada, are looking forward with confidence to supplying more than $75 million worth of products to help satisfy the U.S.A.'s " particularly immense demand " for aluminium. The superlatives applied to current American needs seem to be justified, in the light of news received from our New York correspondent this week. It points to the likelihood that the U.S. Government will initiate a $500 million programme to raise aluminium production by 1000 million lb. a year to secure a total of around 2400 million lb. annually by mid-1952. Present rated capacity is thought to be around 1400 million lb. of pig and ingot. That proposal, with which the Aluminum Co. of America, Reynolds Metals and the Kaiser Aluminum & Chemical Corporation are expected to be associated, illustrates the American view of what the future is likely to require. It will, unfortunately, contribute nothing to arrest the scramble for aluminium which growing rearmament programmes may intensify in the course of next year.

Old Names Die Hard

LONG ago, when many of the elements known to-day had still to be isolated and Mendeleeff had yet to launch his periodic classification upon an unsuspecting Russian Academy of Science, the naming of the new discoveries as they materialised seems to have been a pleasantly haphazard business. Frequently some outstanding property of the new substance helped the discoverer to designate his brain child with a name which would itself convey something characteristic of the element. They had the inestimable advantage of unfettered use of the Greek language. Chloros—green—describes chlorine gas pretty well, though perhaps a little lacking in imagination. It was, however, a distinct improvement on " dephlogisticated marine acid air " or even the relatively terse oxymuriatic acid. Tempers may occasionally have become ruffled, as when a gas declined to exhibit any affinity for the other elements and was deservedly dubbed " argon," which gives a hint of the original frustration. This, however, is nothing to the frustration that may exist in a few years if the nomenclature of the elements becomes a rigid thing, with its own system and laws—and exceptions. So far, it must be admitted, there has been no rush to conform to last year's recommendations by the Commission on Inorganic Nomenclature. "Why upset the present system?" ask the chemists. The well-known names serve their purpose as well as any others, and the rest do not concern many of us anyway. There does not, for example, seem to be any urgent argument in favour of re-adopting the name " wolfram " for tungsten. Tungsten has come to stay, even if W must be its symbol. The argument that the uninitiated can guess Al for aluminium and U for uranium, but not Hg, Sb, (or W!), etc., seems rather pedantic. Let the chemist retain some of his rapidly diminishing esotericism. Everyone loves a secret, and the chemist is no exception.

Training in Iron Founding

Recruits to the iron founding industry needed more technical education to give them the right background, said Mr. S. H. Russell, chairman of the trustees of the National Foundry Craft Training Centre which was opened last week at West Bromwich. The centre provides a comprehensive training syllabus and should prove a help to greater productivity.

FIRST CHEMICAL PRODUCTIVITY TEAM

Ten to Study U.S. Pharmaceutical Industries

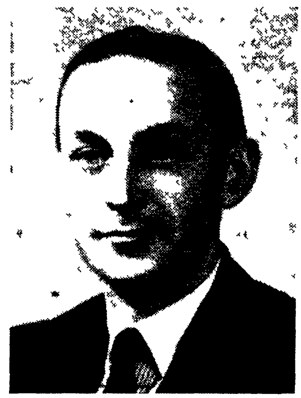
THE first productivity team drawn from the chemical industry—disregarding the recent tour by the fertiliser group—left for the U.S.A. last Wednesday. This was the pharmaceutical team sponsored by the Association of British Chemical Manufacturers, the Association of British Pharmaceutical Industry and the Association of Chemical and Allied Employers.

The visit has been arranged by the Anglo-American Council on Productivity under the technical assistance provisions of the Marshall Plan.

The team will spend between five and six weeks in America investigating compounding or processing (mixtures, solutions, etc.), tableting, bottling, ampouling, sterilisation and packaging—in short, all operations, subsequent to the manufacture of the essential chemicals, necessary to prepare pharmaceutical products for the market. It has the following 10 members representative of management, technicians and workpeople:—

Supervisory Level:—H. G. ROLFE, pharmaceutical director, British Drug Houses, Ltd. (Team leader); W. C. J. COUGHTREY, factory manager, Glaxo Laboratories, Ltd.; G. R. PAGE, manager, pharmaceutical laboratories, Evans Medical Supplies, Ltd.

Technicians:—JAMES BRENNAN, superintendent in charge of pharmaceutical processing, Imperial Chemical Industries, Ltd.; L. G. MURPHY, pharmacist, Burroughs, Wellcome & Co.; H. SMITH, draughtsman-section leader, Imperial



Mr. H. G. Rolfe

Chemical Industries, Ltd.; R. E. LEWIS, manager, production control, Evans Medical Supplies, Ltd. (Team secretary); W. A. WOODWARD, head of pharmacy unit, research and development division, Glaxo Laboratories, Ltd.

Workshop Level:—W. J. LEDSHAM, checker, Evans Medical Supplies, Ltd. (member of the Union of Shop, Distributive & Allied Workers); W. T. IRVING, fitter chargehand, Imperial Chemical Industries, Ltd. (a member of the Amalgamated Engineering Union).

The team will make a report on its findings, which will be obtainable from the associations and the Anglo-American Council on Productivity (U.K. Section).

Twice as Many Chemical Engineers before 1954

ENGLISH universities in 1954 will be training 100 per cent more chemical engineers, yet that will not satisfy the estimated demand by industry. This is the principal conclusion, not entirely unexpected, presented on Wednesday in the report of the chemical engineering panel of the Ministry of Labour's Technical Personnel Committee. Having fully surveyed the engineering field—chemical and allied industries, chemical plant manufacture, gas, oil, coal and Government departments, the special sub-committee estimates that the supply of qualified chemical engineers from all sources between 1950 and 1954 will number only about 1100. The minimum requirements of industries within the same period may be 1300, so that universities and diploma courses, etc., may be expected to fulfil only about 85 per cent of the demand.

In its recommendations to relieve the shortage the sub-committee places its reliance upon the universities, in the setting up of strong chemical engineering departments, provided the general shortage of teachers and of students of the right calibre can be eliminated. While it feels four years' post graduate study for practioners is desirable, the experts agree that it is not impossible to qualify in three post-graduate years.

RISING CHEMICAL IMPORTS

Latest Total Nearly £1m. more than in September, 1949

SEPTEMBER imports of chemicals, drugs, dyes and colours, valued at £2,852,727, again showed nearly £1 million increase over the corresponding month of 1949 (£1,905,849). The figure is, however, more than £280,000 smaller than the August total. Notable increases in relation to the equivalent figure a year ago, were: Boric acid £34,916 (£6540), borax £74,962 (£1837), fertilisers £36,197 (£8), potassium compounds £687,831 (£568,050), sodium compounds £204,046 (£70,680), synthetic organic dyestuffs £114,638 (£67,840), extracts for tanning (solid and liquid) (£138,186 (£52,253), essential oils, other than turpentine £359,304 (£194,059), sulphur £373,207 (£93,428), plastics materials £450,383 (£307,857). A conspicuous reduction was represented by the total value of imported gas and chemical machinery, which in September was £12,440, against £117,823 in the corresponding month last year.

	Sept., 1950	Sept., 1949
	Cwt.	Cwt.
Acetic anhydride	12,527	11,055
Boric acid	12,540	3,420
Carbolic acid	1,485	—
Value of all other sorts of acid ...	£60,783	£53,035
	Cwt.	Cwt.
Borax	47,900	1,000
Calcium carbide	—	1
Cobalt oxides	268	614
	Tons	Tons
Fertilisers	4,020	—
	Lb.	Lb.
Glycol ethers and glycol ether-esters	787,036	1,016,817
Iodine	42,941	151,391
	Cwt.	Cwt.
Potassium chloride	832,656	675,058
Potassium sulphate	21,300	33,398
All other potassium compounds	24,516	2,666
Value of all potassium compounds	£687,831	£568,050
	Cwt.	Cwt.
Sodium nitrate	60,020	60,000
All other sodium compounds ...	28,658	6,544
Value of all sodium compounds	£204,046	£70,630
Value of chemical manufactures, etc., all other sorts	£796,481	£468.898
	Cwt.	Cwt.
Synthetic organic dyestuffs ...	1,738	764
Extracts for dyeing	1,250	988
Extracts for tanning (solid or liquid)	60,051	24,629
All other dyes and dyestuffs ...	254	77
Earth colours (except black) ...	15,309	16,392
Carbon blacks from natural gas	31,302	44,160
Value of carbon blacks ...	£130,233	£143,068
	Cwt.	Cwt.
Other blacks, including vegetable, lamp, acetylene and bone	15,198	9,671
Value of paints and extenders ...	£288,623	£226,844
Value of chemicals, drugs, dyes and colours	£2,852,727	£1,905,849
	Lb.	Lb.
Essential oils (other than turpentine)	341,696	281,326
Value of essential oils	£359,304	£194,059
	Lb.	Lb.
Synthetic oils	4,800	1,293
	Cwt.	Cwt.
Mineral jelly	16,549	6,556
Wax petroleum : paraffin wax	62,950	24,673
Value of oils, fats and resins ...	£11,991,492	£8,660,658
	Tons	Tons
Sulphur	37,895	12,225
Value	£373,207	£93,428
	Cwt.	Cwt.
Gas and chemical machinery ...	601	7,884
Value	£12,440	£117,823
	Cwt.	Cwt.
Plastics materials	24,526	10,307
Value	£450,383	£307,857

Merits of Flame Spectrometry

THE attractions of the uses of the flame spectrometer, although somewhat limited in the determination of content of rocks and minerals were discussed at a recent meeting at Poole, Dorset, organised by the Physical Methods Group of the Society of Public Analysts in collaboration with the local section of the Royal Institute of Chemistry.

Simpler Method

One of the papers (G. H. Osborn, F.R.I.C., A.M.Inst.M.M., and H. Johns, B.Sc.) dealt with the simplification of means of determining quickly sodium and potassium contents. The chemical method, it was observed, was a tedious process requiring experience and skilled technique.

The preferred alternative, the determination of sodium and potassium by means of a flame spectrometer, was applicable, at present, only to those rocks and minerals which were rendered soluble by combinations of various acids. The determination of the sodium and potassium in the acid solution was extremely simple and rapid; standardisation was by the internal standards technique.

The time taken for the determination of these elements in a rock or mineral should not exceed half-an-hour. If considerable quantities of the other alkalis or alkaline earths were present, those could be determined at the same time.

Wider Scope for Synthetic Detergents

New U.S. Developments — U.K. Applications Reviewed

NEW soapless soaps, which are stated to remove dirt, bacteria, and unpleasant smells and promise to have wide application in the home and in industry, have been developed in joint research in the U.S.A. This was disclosed at a recent meeting of the American Chemical Society.

The new chemically stable synthetic detergents are said to be ten times as effective as any known deodorant. In industries where obnoxious odours are produced the use of these detergents should prove effective. The detergents retain their disinfecting qualities in all operations.

In the germicidal field the new detergents can be used in solution and also as solid powders or pellets. In pellet form, when dissolved in a given quantity of water, they will produce a strong germicidal solution.

Another property of these new types of invert soaps is their stability and compatibility with diluted as well as concentrated acids. In acidic solutions they show detergent and cleansing properties of a high order. Detergent properties in strongly acid solutions are highly desirable in numerous types of large-scale heavy industrial and communication equipment, such as in the cleansing of ships, locomotives and coaches. The new soaps' emulsifying powers in acidic solutions suggest use in organic chemical operations where expensive and inflammable solvents are at present necessary.

The new detergents, morpholinium alkyl sulphates, are crystalline, odourless, and non-sticky.

THE autumn session of the London and South Eastern Counties section of the Royal Institute of Chemistry commenced this year with a meeting on Thursday, September 21, at the Gravesend Technical College. The meeting was opened by Dr. C. W. Herd, the section chairman, supported by the honorary secretary, Dr. K. G. A. Pankhurst.

Mr. J. S. Meredith spoke on "Some Practical Applications of Detergents."

Mr. Meredith outlined the growth of the detergent industry and the functions of detergents from the oldest soaps to the newest synthetic products. He pointed out that the new products could be divided into three types—anionic, cationic and non-ionic, and that the molecular structure could be adjusted to meet the various needs of diverse industrial applications.

While by far the greatest application of detergents is in the textile industry, Mr. Meredith gave a very comprehensive account of applications to other industries which are of considerable local interest, such as cement manufacture, paper manufacture, brewing, engineering, etc., and a host of general uses, including laundry work, the preparation of cosmetics, and fire fighting. In view of the undoubted advantages of "soapless soaps", particularly in hard water districts, the manufacturers had no fear of the future. Mr. Meredith very effectively proved his point that there is hardly any industry in the country which now does not make some use of these synthetic materials, with considerable advantage to its productive capacity.

Chilean Nitrate Problems

INCREASED production in Tarapaca has been promised by the Nitrate Corporation of Chile, in view of the Government assistance in helping to arrange finance in the U.S.A. for the necessary additional plant and equipment. Higher production costs and reduction of nitrate prices to meet synthetic competition may call for further Government aid if the nitrate industry is to continue at its present rate of production. The evaporation plant at Tocopilla is to be completed by next June by the Anglo-Chilean and Lautaro companies. The plant will cost \$4½ million and is planned to produce 50,000 tons of nitrates yearly.

Increasing Canadian Oil Output

CANADA's crude oil and natural gas output reached a peak total of 12,498,255 bls. in the first half of this year, showing an increase of 27 per cent over the previous record of 9,812,595 bls. established in the corresponding period of 1949. The output of Alberta Province accounted for 11,782,870 bls., which compared with 9,169,908 bls. in 1949. Production of refined oil products was 18 per cent higher in April and the first four months of this year than in the corresponding periods of 1949. The month's output was 6,987,027 bls. (5,867,875 bls. in 1949) and the first four months 27,951,911 bls.

PARLIAMENTARY TOPICS

PARLIAMENTARY authority has been granted to extend the period during which the Government can make use of patented inventions for the services of the Crown and associated services without recourse to further agreements with the owners of such patents. The President of the Board of Trade, Mr. Harold Wilson, said that the need for an extension (the period of which was not specified) was because they apply not only to defence production purposes, but also to the needs of the export drive, the maintenance of supplies and services and the provision of machinery designed to increase the country's productivity in agriculture, industry and housing.

THE President of the Board of Trade said he was prepared to consider any proposals by the paint, synthetic resin and allied industries for improving the present system of allocation to them of glycerin.

AUREOMYCIN was already being imported from the U.S.A. and the import of terramycin would be considered if the need arose, said the Minister of Health, Mr. Aneurin Bevan.

IN reply to a further question by Commander A. H. P. Noble, Mr. Harold Wilson confirmed that steps had been taken by the governments concerned to make as effective as possible the control of strategic items, such as molybdenum, in the country of origin, where the first responsibility lay.

EFFECT of NATIONALISATION

IF the Iron and Steel Act went through, as intended by the Government, two of the subsidiary companies of Thos. W. Ward, Ltd.—The Wolverhampton Steel & Iron Co. (1946), Ltd., and Birchley Rolling Mills, Ltd.—would be taken over, said Mr. George Wood (chairman) to shareholders at the 47th ordinary general meeting. Everything that had happened up to the present in State-owned and nationalised industry was a tale of woe with astronomical losses, losses which could only be paid for by reductions in standards of living, recalled Mr. Wood.

The relations between men and the new masters had been worse than anything under free enterprise. A sense of frustration in both management and men was widespread and had resulted in unofficial strikes and in general resentment of trade union control. Wages were high but the unrest in industry was clear evidence that no benefit had been obtained from the higher wages nor could such benefit ever be attained unless production was increased. Such an increase was an impossibility under State control.

He found it hard to believe that the people of this country had so far lost their self-reliance and virility as complacently to accept the general policy of nationalisation of all industry, particularly when there was such overwhelming evidence that compulsion of business by the State meant compulsion of the workmen by the State.

No Blackouts

WHATEVER failings may have been observed in the House of Commons' handling of national problems of electricity supply, its provision for its own re-built chamber ensures that "production" will not be at the mercy of public current supplies.

Any danger of blackout through power failure or other reasons has been eliminated. 216 pilot lights have been provided in the chamber, division lobbies, corridors, exits and lifts. All have a secondary source of supply from an emergency battery on the Keepalite system.

The battery, consisting of 122 Chloride Plante sealed-in type cells with a capacity of 180 a.h. at the 10-hour rate, is able to supply a load of more than 10 kW at 240 volts for three hours. When the main supply is interrupted, the secondary lighting load is changed to the battery by an automatic switch.

To ensure accurate time-keeping during mains failures or periods of abnormal mains supply frequencies the 166 electric clocks are operated from a master clock and supplied by a chloride battery of 25 cells with a capacity of 20 a.h. at the 10 hour rate. All batteries are maintained on a trickle charge.

£1m. for Nuclear Research

The Department of Scientific and Industrial Research is to spend £1 million on nuclear research at British universities, it was stated in Glasgow last week by Dr. H. Buckley, chief of the department's office in Edinburgh. About £250,000 was being given by the department to Glasgow University in connection with the building of a synchroton.

TECHNOLOGICAL EDUCATION

Can Universities Serve All the Needs of Industry?

"LET me declare my bias. I am against the proposal to found a separate university of technology. I am therefore the more anxious to state fairly the serious arguments for it," said Lord Eustace Percy at the start of his lecture on "Technical Universities," given at a meeting of the education group of the Institute of Physics, in London on October 25.

The mere impulse to imitate America or Switzerland, he thought, could be ignored, as could the controversy as to whether in English universities students of arts and pure science mixed sufficiently with students of technology to make university association between them a reality. It was simply not true to say that existing universities would be swamped by technological students if they were to try to meet the full technological needs of industry. The committee which bore his name did suggest that universities could not be reasonably expected to meet more than 45 per cent of the demand for professional engineers, estimating that demand at about 3000 a year. But the rough survey on which the Percy report was based was carried out in 1944 when no one foresaw the post-war growth of the universities. Since then, it had been seen that to double the output of university scientists in a few years had been an easier task than even the later Barlow committee imagined.

Preponderance of Arts

Between 1938 and 1949, the number of technological degrees granted by universities was, in fact, rather more than doubled, yet in the year 1948-1949 technological students still represented only 13 per cent of the total university student body as against 44 per cent for arts students. In the Newcastle division of the University of Durham the corresponding percentages were 27 for technological students and 25 for arts, and he honestly thought that the technological aspect had done the university no harm.

The serious argument for a new technological university was, he took it, the one which had been advanced by certain eminent scientists that the bias of scientific studies in the universities was towards pure research and that studies imbued with that bias could not be expected to develop the practical interests and the executive qualities of mind which were proper to technologists. The expulsion of technologists from existing universities would, therefore, have to be accompanied by a no less wholesale exodus of professors of pure science.

The argument did not contemplate any greater specialisation in technological training at the undergraduate stage. At that stage, he suggested training should be based on a much wider and deeper study of fundamental science than at present. In other words, the argument did not seem to contemplate any change of curriculum.

Teaching Problems

The scientists' emphasis on individual work tended to conflict with the team work by which all successful research was conducted to-day and always had been. A large proportion of the university graduates were keen to escape from the drudgery and the team work of the office or factory into some individual occupation. Without some alteration in the teaching of modern science, a large emigration to a technological university would be nearly impossible. First class teachers of science would not willingly go to a new institution, whether they were just serving science or just serving technology.

The teaching of technology presented a variety of problems, and it was difficult in this country to organise anything like the systematic exchange—possible in some countries—of teachers between the universities and industry, thus integrating university teaching with industrial training. A revolutionary university organisation, such as had been proposed, would tend to shirk the real issue. He thought experiments were best carried out in existing institutions.

Local Authorities

The Percy report recommended that a few technological colleges should be selected and turned into institutions of higher technology. He now knew it to be true that no such development could be hoped for so long as technological institutions were owned and run by local education authorities. Such a plan could not be administered by a municipal committee. They had only to compare the Royal College of Art when it was governed under his (Lord Percy's) jurisdiction and as it was now.

Balance in the universities was not a matter of numbers. There was no reason why a university should not double or treble its technological students while those in its art and other departments remained stationary. It should be borne in mind that industry did not only, or indeed chiefly, require good engineers or good metallurgists. Its chief demand to-day was probably for good physicists, and it would not thank the educationists for a policy which left the pure scientist to be trained in the academic atmosphere of university honours schools while removing the applied scientist to the more bracing climate of a technological institute.

Experience and Salary

The prejudice on the part of students against going in for technology rather than pure science was probably influenced by what he believed was the practice in many cases which permitted a science student of, say, five years' training to receive the salary of a fully experienced scientist, be he a physicist or chemist. If industry would require of applicants that they had had some experience of industry before receiving a fully qualified person's salary—without, of course, interfering with their university training—it would be better.

A number of scientists entered into the discussion which followed. This was opened by Lord Cherwell, who said he was in agreement with Lord Eustace Percy on one point—that expansion in technoligical education was required. But how was that expansion to be obtained? The way Lord Eustace Percy favoured was that expansion should take place in the existing universities, but he (Lord Cherwell) was completely unconvinced that anyone could truthfully say that the technological university was unnecessary. It existed, and functioned successfully, on the Continent, and because a man went to one of these institutions it did not follow that he must only work in applied science; he had been taught fundamental science as well.

There was a difference between the purely practical man and the pure theorist which should not exist. The aim of training should be a smooth marrying of the theoretical and the practical.

A speaker on the staff of Imperial College said they could not get the post-graduate students from industry. If they did find a man who was suitable to take a post-graduate course he was generally regarded as so important to industry that his employers would not release him.

Another speaker expressed the opinion that technology and the application of science in British industry to-day was not a jot behind America or any other country. He did agree, though, that an educated man—that was, a generally well educated man—made a better engineer, or a better applier of science. He agreed wth Lord Percy that it was desirable to devise a means of getting the closest possible liaison between the appliers of science and the fundamental scientists.

Grants Suggested

The suggestion was made by another speaker that the University Grants' Committee might do well to spend some of its funds in sending a man back to the university after he had spent some time in industry. The grant should be an ample one—one that would enable a married man with a home of his own and perhaps a family to leave industry for the time being. That would require something in the nature of a £600 a year fellowship.

Science and the Human Values

THE need to distinguish between science and technology was emphasised by Sir Lawrence Bragg, Nobel Prize winner and director of the Cavendish Laboratory, Cambridge, when he delivered the Radford Mather lecture of the British Association at the Royal Institution, London last week.

Sir Lawrence Bragg defined science as the pursuit of knowledge, and technology as the exploitation of such knowledge when a possible use for it had become clear. The present tendency to attack science, was therefore not really an attack on science itself, but on the uses to which scientific knowledge had been put.

It would be asked if the technological advances made possible by science brought us nearer the millenium, or were they the contents of a Pandora's Box which had released countless troubles upon mankind? Scientists today were forced to meet challenges which would not have concerned them a generation ago. Many men and women were wondering whether the benefits of science were not outweighed by the complications of life resulting from its application.

The new world, continued Sir Lawrence, was like a higher type of organism. What happened in one part more or less intimately concerned the whole. There must be a re-phrasing of values and this could only be done by an integration of the humanistic and the scientific outlook.

POLYVINYL RESIN AND LATEX

Production and Properties of New Resins and Dispersions

POLYVINYL materials came to the fore during the war and are finding sc many applications in such a variety of industries that manufacturers have never found it easy to produce all that is required. Polyvinyl resins and latices are now produced by two British companies, one of which, British Geon, Ltd., specialises exclusively in the vinyl field, using indigenous basic materials, at Barry, Glamorganshire. Evidence of the growth of demand for polyvinyl material is the fact that the size of the factory, which has been operating only for about 2½ years, has already been considerably increased, and pressure on the existing capacity is now urging the need for further extensions.

The company's research laboratories are engaged on a continuous programme, aimed at improving existing materials and techniques and developing new products. There is already in production a substantial range of polyvinyl materials and the introduction of further products is only limited by plant capacity. The resins produced are of two chemical types, the Geon 100 series being polymers of vinyl chloride and the Geon 200 series copolymers of vinyl chloride and vinylidene chloride.

Cooling and Polymerisation

Vinyl chloride is prepared commercially by the catalytic hydrochlorination of acetylene, both gases being derived from water, salt, coke and limestone. For convenient handling, the gaseous vinyl chloride is usually liquefied by cooling below its its boiling point of -18.8° C. The single molecules of vinyl chloride monomer are then polymerised under closely controlled conditions to form the longer chain molecules which constitute the polyvinyl chloride.

Among the most important properties of the Geon 100 series resins are thermal and light stability, toughness and chemical inertness, which have been proved in the course of comparative tests. The volume resistivity of a fully flexible Geon insulation compound measured at 20° C. by the BS 903 method can readily exceed 1×10^{14} ohm-cm. The high dielectric properties of Geon 101, and to some extent its general heat stability, are due to the purity of the material, which has been achieved by the care taken during manufacture to ensure minimum occlusion of electrolytes.

For many purposes this material has been found superior to natural rubber, since it is practically non-ageing, does not support combustion, is non-hydroscopic and is unaffected by ozone. It is highly resistant to weather exposure and to most acids, alkalis, oils and solvents.

Simplified Deposition

The PVC resin, of which most use is made, is Geon 121 paste. With relatively simple equipment, products similar to those made by the conventional moulding, calendering, solution or latex coating techniques are being produced with substantial economies. To deposit vinyl materials on cloth it was formerly necessary to employ a calender, the 4-bowl calenders normally used for this purpose costing about £25,000 each. Solution coating methods, also previously employed, have the disadvantage that large quantities of expensive solvents must be employed, while substantial coatings need many passes to build up the thicknesses required. These factors result in high production costs which can be greatly reduced by the use of pastes.

The particle size of Geon 121 paste resin is in the region of 1 to 1.5 microns, which is smaller than that of the normal PVC, and the particle shape is also different. Mixed in the cold, this new resin readily disperses in certain plasticisers to give pastes for spreading, moulding, casting and dipping. It is an important advantage of the paste process that it is necessary to heat the vinyl composition only once, although the heating must be sufficient to drive the plasticiser into the resin; to ensure complete fusion the mass must be heated above 175° C.

In processing other types of vinyl resins, the use of heat is necessary during at least two stages of the operation. They require to be plasticised on a hot mill or other heated equipment and then to be calendered on hot rolls or extruded through a hot die.

Using a Geon 121 organosal formulation (substantially resin plus plasticiser), films and coatings up to .004 in. thick can be made in one operation. For films and coatings between .004 in. and .02 in. thick, also made in a single pass, a plastisol type formulation (resin plus

plasticiser plus non-solvent diluent) is preferred. Pastes having an approximately 60/40 resin/plasticiser ratio are usually coated on fabric or paper, using the normal doctor knife technique. A machine designed for spreading rubber compounds is quite suitable. The deposited film can be gelled at about 180° C. by passing over a hot drum with the fabric side down.

Alternatively, thicker films can first be set on a standard type steam chest at 180° C. and are subsequently gelled completely at 180° C. by infra-red or other forms of heating before passing between cooled embossing rollers. The process can, if necessary, be carried to completion in one stage. The paste technique also offers a definite advantage over other methods in that the partially gelled material can be stored indefinitely and conveniently finished when an order is filled.

Domestic and Commercial Films

The many useful applications of paste films and coatings include thin films (.001 to .002 in.) for food packaging, coatings of medium thickness (.004 to .008 in) for vinyl "oil-skins," kitchen table coverings (vinyl American cloth), industrial protective clothing, etc., and heavy films (.015 to .02 in.) suitable for upholstery, luggage, etc., the last being by far the largest quantity used. All these may be printed or embossed as required. All products made with Geon 121 pastes have, *inter alia,* petrol, oil and solvent and abrasion resistance. In general, the use of Geon 121 resin is claimed to enable many established processes to be simplified and modernised, including methods in current use for producing manufactured goods and for discovering new ways in which pastes can be applied.

Of the 200 series of vinyl chloride-vinylidene chloride copolymer resins, the most important are Geon 202, 205 and 200X20, although the last is not commercially available.

The first step in the manufacture of these resins is the preparation of trichloroethane by reacting some of the vinyl chloride monomer with chlorine. By suitable treatment with caustic soda the trichloroethane is next converted into vinylidene chloride monomer through the loss of one molecule of hydrogen chloride. The two monomers are then polmerised in the correct proportions, giving a product in which vinyl chloride molecules are interspersed with vinylidene chloride units to form long copolymer chains.

Geon 202 is slightly more thermoplastic than Geon 101, otherwise its general properties are the same. It is therefore, used similarly to Geon 101, except as a dielectric material, but has the advantage that it can be processed at temperatures about 20° C. lower than Geon 101.

The principal use of Geon 205 is as the basis of rigid compounds for processing by extrusion, or injection or compression moulding. A most interesting use has been in the production of the new long-playing records by the Decca Record Co., an application which illustrates the extreme accuracy of moulding which is possible with rigid vinyl materials. On each side of a 12-in. long-playing record approximately one-third of a mile of sound track is precision moulded, with a precision better than .001 in.

So far, no Geon solution resin is yet being made in Britain, although the new Geon 200X20 resin is suitable for this type of processing. British Geon, Ltd., has as yet been able to import only very limited quantities of this resin from the U.S.A. from its associates—the B.F. Goodrich Chemical Co. The same is true of 400X65, a new modified vinyl resin which can be used for the same purposes as Geon 205 and Geon 200X20.

Polyvinyl materials in latex form can be employed for purposes and by techniques normally not practicable with vinyl resins in their more conventional forms. Companies already equipped to use latex techniques, when changing over to vinyls would obviously prefer to use them in latex form. Geon vinyl latices are colloidal dispersions of vinyl type polymers in water, resembling rubber latex in appearance.

Wide Resistances

Films, impregnation and coatings of these latices have all the desirable properties characteristic of vinyl materials. They will not perish or rub away, are easily sponged clean, can be coloured or printed on with no loss of properties. They resist water, acids, oils and greases, do not readily peel or crack and are not easily stained. They are highly resistant to weather exposure, salt spray, tropical conditions and fire. The properties of any absorbent material in any form can usually be improved by treatment with the correct latex.

The two main types at present produced by Geon, Ltd., are Geon 352 and Geon 652. These differ in certain important respects. Geon 352 is an unplasticised water dispersion of a modified vinyl chloride resin, the solids content of which is approximately 55 per cent. Geon 652 is a water dispersion of a vinyl type resin, the solids content of which is also approximately

the same. This latex contains no added plasticiser, the resin itself being internally plasticised by adjustment of the molecular structure during manufacture.

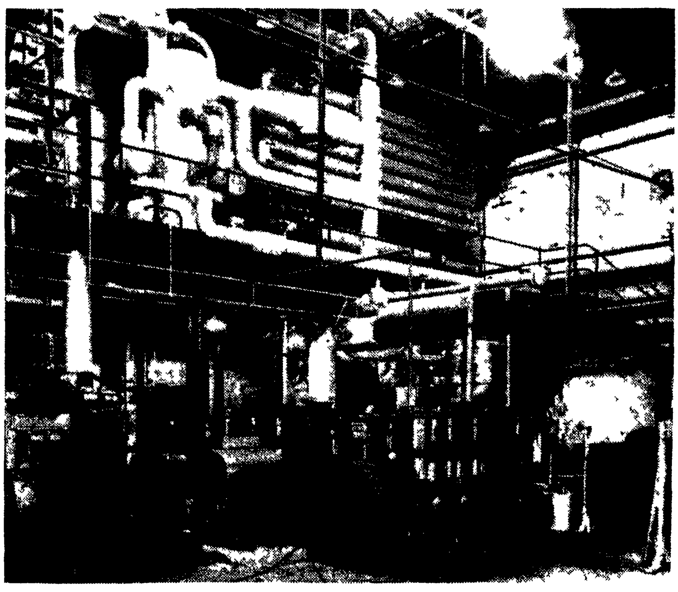
Film and coatings from the 352 latex and its plasticised forms, after drying, require heating for a short period at 130° to 150° C. to develop maximum properties. Those from Geon 652, however, give tough, flexible films on simple air drying, although the application of moderate heat in the last stages will speed up drying of the film.

While the 352 latex type films offer fair resistance to the passage of water vapour, those from Geon 652 are extremely impermeable, being about 20 times more resistant than the former. On the other hand, the stability of Geon 652 to heat and ultraviolet light is rather less than that of films made from Geon 352. The base resin of 352 is in turn less stable in these respects than a straight polyvinyl chloride resin such as Geon 101.

Geon 352 latex is a well-established material; its compounding and processing techniques and film properties having been extensively studied. Geon 652, however, is comparatively new. With its valuable property of air drying and its extremely low moisture transmission rate, it has enabled vinyls to enter many new fields. The technique of compounding and processing this latex, however, have not yet been fully explored, nor has it been possible as yet for data to have been accumulated on all the properties of Geon 652 latex films.

Whereas Geon 352 can be stored for very long periods provided that the pH is not allowed to fall below 7, Geon 652 is a tricky material to handle. Its pH has a tendency to fall during storage, a characteristic which is accelerated at elevated temperatures. Geon 652 latex, however, is able to withstand a considerable fall in pH (as low as 3) without harm. The resin has a tendency to settle out during storage, but the latex may be restored to its original condition by gentle stirring, if it has not been left standing too long. Additions of compounding ingredients to 652 require to be made only before ageing and use, the pH of the latex being first checked and, if necessary, adjusted with trisodium phosphate or a similar agent. Thus, although Geon 652 can be handled quite successfully, it is usually advisable to consider the use of Geon 352 first unless some of the special properties of 652 are really needed.

In general, Geon 352 should be used when heat can conventionally be applied to the article being treated, though heat needs to reach only as far as the latex has penetrated, and then only for a short period. If heating is either inconvenient or impracticable, or among other properties very low moisture vapour transmission rate is required, then the suitability of Geon 652 should be investigated.



In this large refrigeration section vinyl chloride is brought to to the carefully regulated temperature required for complete polymerisation. This is one of several critical processes upon which the retention of the special qualities of the resin largely depend

[*By courtesy of British Geon, Ltd*]

THE WORLD'S DEEPEST LIMESTONE MINE

Mining and Processing Half-a-Mile Underground

One of the powerful electric shovels in the Baberton (Ohio) limestone mine

THE importance of limestone in the manufacture of heavy chemicals has brought about a remarkable chemical engineering achievement in Ohio, U.S.A.

Ten years ago, following nearly a quarter of a century of planning, the Columbia Chemical Division of the Pittsburgh Plate Glass Co., at Baberton, began to sink shafts to the extensive limestone beds situated nearly half-a-mile below the earth's surface.

Twin shafts, 550 ft. apart, were driven into the Ohio farmland two miles north of Columbia's alkali producing plant. Drilling and mining crews, advancing an average of 6 ft. a day, blasted and drilled straight down through scores of sandstone and shale formations, to start the world's deepest limestone mine.

That mining at this depth would be expensive, was fully appreciated. Advantages, however, would be a guaranteed steady supply of limestone of high lime content, expensive freight charges would be eliminated, and the need for maintaining large reserves of the material during winter months when the Great Lakes are ice-blocked would be minimised.

More than 400 days were required to sink the vertical shafts, measuring 16 ft. by 7 ft. The walls of the shafts were framed with steel and lined with concrete, one to a depth of 2323 ft. and the second to a depth of 2258 ft.

Boring through the first 800 ft. beneath the surface, water was encountered flowing at the rate of 60 gallons a minute. This flow was collected into a sump and delivered back to the surface by automatic pumps. Oil in small quantities was met at a depth of 520 ft. Slight pockets of methane gases were found around the 2000 ft. depth, but these dissipated rapidly and proved to be of little difficulty to the mining crews.

Each shaft was operated on four six-hour shifts, the operation proceeding seven days a week. An average of 22 lb. of dynamite was utilised in blasting each foot of shaft. Approximately 100,000 lb. of the explosive were discharged in blasting operations.

For the development of "rooms" to house the underground crushing unit, transformer room, conveyor galleries, and the 550 ft. "drift" connection between the two shafts, more than 30,000 tons of rock were removed to provide working room for the crushing and conveyor equipment.

Mechanisation Problems

One of the main problems of working at such a depth was the lowering of equipment needed to operate the so-called "deep lime" operation. All heavy machinery had to be dismantled and reassembled by skilled workmen on reaching the limestone bed. Crushing equipment, capable of smashing stone weighing up to three tons, had to be lowered to the working surface and assembled. Much of the equipment had to be specially designed so that it could be lowered through the shaft compartment.

The Baberton operation was a pioneering venture in this form of mining and numerous situations, new to the mining industry, were encountered. A large proportion of the equipment was specially designed by engineers of the Columbia Chemical Division. To-day a working force comprised of miners and skilled workmen such as electricians, boilermakers, painters, riggers, are producing the limestone essential to the operation of the Division's chemical producing plant at Baberton.

The mine itself is now a series of rectangular rooms about 82 ft. wide with a ceiling of 28 ft. Mining engineers call the development method used at Baberton "a two-entry room and pillar method of development." To the layman, the mine openings appear to be long, level, rectangular tunnels blasted out of solid limestone.

At the advanced working surface holes for dynamite charges are drilled into the limestone rock with pneumatic drills mounted on labour-saving, mobile rigs. The holes are spaced so as to break limestone rock of suitable size for the crushing equipment. The actual explosion employs electric delay blasting caps. As much as one ton of explosive is used each night.

"Scalers" move in the following morning to prise loose rock from the walls and ceiling. The blasted limestone, some in sections weighing several tons, is loaded by electrically powered shovels into diesel driven dump trucks.

The primary crusher, within the mine, ensures that the largest piece is not more than 6 in. in diameter. A conveyor belt system passes the mineral to a 400 ton capacity storage bin from which it is lifted up the production shaft by automatically operated 10-ton capacity skips.

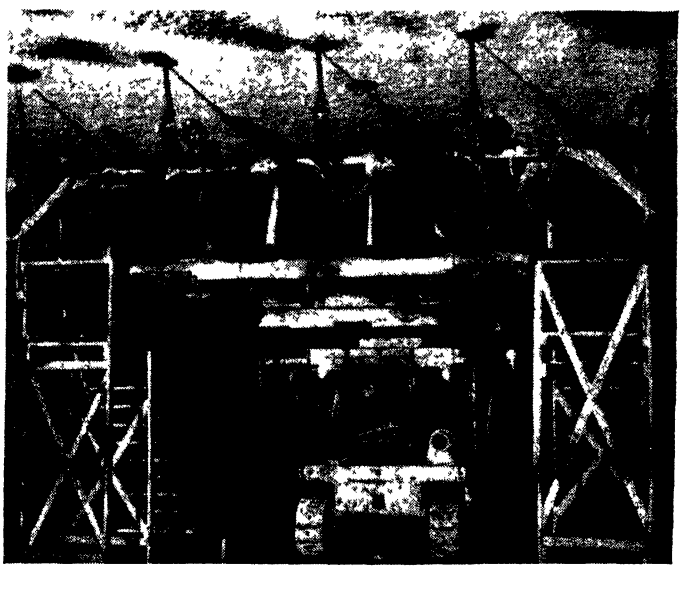
In the surface operation the stone is again passed on broad rubber conveyor belts to the screening mill. Electric lorry cars transport stone screened from 1in. upwards to the alkali plant. Of the remaining stone less than 1 in. in diameter, about half is processed into agricultural limestone and the balance goes into various sizes of commercial aggregate for asphalt for concrete manufacture, road construction and other commercial applications.

Rock temperature in the mine is 88° F. but a down draft ventilating current, giving 100,000 cu. ft. per minute, supplies ventilation and cuts the temperature to about 70°. The forced air current passes through the working areas and returns to the surface through the production shaft. The direction of air flow can be reversed.

Drinking water from the company's own filtration station on the surface flows down through a half mile of pipe to the electrically cooled water fountains. Located in the brightly lit working area near the service shaft entrance are the machine repair shop, transformer station, mess hall and other permanent installations which give the mine area the appearance of a busy factory.

Northern Queensland Minerals

A syndicate in which are included some Melbourne interests, is to exploit the raw materials occurring in the Bowen coastal district of Northern Queensland, Australia. The substances include magnesite, asbestos, gypsum, lime, pyrites, ochres, various oxides and pottery clays. An initial enterprise has been the establishment of a £25,000 works to process agricultural lime, employing a £10,000 rotary kiln.



Limestone drilling team working from a Jumbo platform. Holes are spaced so that the blasting operation will break the limestone into lumps of the maximum size that can be handled by the loading equipment. Very fine stone is unsuitable for use in the chemical plant of the Pittsburgh Plate Glass Co.

Metallurgical Section

4 November 1950

WELDING RESEARCH

Aspects of BWRA Work at Abington

RESEARCH work in progress at Abington Hall was shown to the technical Press when they visited the engineering and resistance welding laboratories of the BWRA at Abington recently. Among several interesting investigations on view were the tests being carried out on vessels and other structures by the use of the new pulsating pressure plant (THE CHEMICAL AGE, 63, 467). Also being shown were various types of equipment for fatigue testing.

The method used for fatigue tests is the production of vibrations close to the natural frequency of a mass spring system in which the test pieces, some of very considerable size, form the spring. Full-scale bridge members are tested by producing push-pull vibrations in a system in which two large masses of steel weighing 4 tons each are coupled by a bridge cord, the whole system being freely suspended in space and excited by a mechanical vibration exciter running at 4000 revolutions per minute. The out-of-balance force produced is in the neighbourhood of 5 tons and this is magnified 25 times by resonance in the test piece.

Fatigue Strength of Joints

Another investigation in progress is concerned with the determination of the fatigue strength of welded joints, of the type which occur in vehicle structures where the loading is applied normal to the plane of the structure and a very complex state of stress is set up at the joints. A cruciform joint between two 6 in. by 8 in. channel sections is the first type of joint investigated. It is proposed to investigate other type of joints and welded joints in light alloys.

A long-term investigation in progress is concerned with the determination of the effect of residual stresses on the fatigue strength of structural mild steel. Residual stresses are introduced in the surface of 2 in. diameter bars by rapid local induction heating to a temperature of 500° C. A small amount of plastic upset is thus produced in the surface and, on cooling, high tensile stresses develop on the surface which are balanced by compressive stresses in the core.

The stresses can be measured by cutting the bar into small sections, which is done by a special slow-speed saw, and the elastic recovery following the cutting operation is measured by a special inductance strain gauge of ½ in. gauge length. The bars treated in this way are fatigue tested by introducing bending vibrations.

Reclaimed Shafts

The same method is used to determine the fatigue strength of shafts reclaimed by welding. Steel shafts of 4 in. diameter with a weld bead deposited in the circumferential groove are similarly vibrated and it has been found from the tests carried out so far that the alternating bending fatigue strength of such shafts is reduced by approximately 2 tons p.s.i. from $\pm$ 13.5 tons p.s.i. to $\pm$ 11.5 tons p.s.i. The laboratory is working on ways and means of increasing this figure to that possessed by the virgin material.

One of the largest specimens tested in the laboratory consisted of a heavy crane rail welded to mild steel flange plates by means of heavy intermittent fillet welds, the whole specimen weighing 1 ton. The object of this investigation was to determine whether fatigue cracks would develop at the stress range to which such joints may be subjected in service and whether, if such cracks developed, they would propagate in the rail or in the flange plates.

The effect of incidental stray flashes produced inadvertently during welding on high duty mild steel components is being investigated because it has been found that such stray flashes, when situated in zones of high fatigue stress, may reduce the life of a part. This effect is ascribed to the formation of a very hard martensitic structure due to the very small heat input. Micro hardnesses of over 1000 Vickers were found in stray flashes of this

type made in mild steel. These hardened structures are frequently associated with minute hardness cracks. While it is impossible to eliminate these cracks in any other way than by filing the flash out, a certain improvement can be obtained by heat softening a hardened structure.

Another investigation recently concluded was concerned with various welded details used in ship structures. This investigation was carried out using large specimens consisting of a piece of plate 10 ft. by 2 ft., to which rolled angle stiffeners are welded. Different types of joints in stiffeners and different methods of connecting stiffeners to plating have been investigated. The results show that when a welded joint is made in a rolled section, a simple butt weld, provided it is of good quality, is superior to any other type of joint made by using reinforcing straps. A number of different types of straps were investigated, and it was found that those at present in use in shipyards are not very strong under fatigue loading. Another type of strap is suggested for the reinforcement of butt welds which is as economical as that used at present and gives a much better fatigue strength.

The Growth of Welding Technology

THE growth of British welding from its beginnings early in this century to its present assured position as the principal means of joining metals was surveyed by Mr. C. S. Milne in his presidential address at a meeting of the Institute of Welding held in London last week.

The first arc welding company was formed in Sweden about 52 years ago, but it was not until some years later that any commercial interest in arc welding was shown in this country. Oxy-acetylene welding was first practised in 1901. Five years later it was on view at the Naval, Mercantile and General Engineering and Machinery Exhibition, and was making considerable progress. This was no doubt partly because it seemed more conventional in those days to melt metals with a flame.

Acetylene Generator

At least four firms were showing oxy-acetylene welding at a similar exhibition at Olympia in 1910. It was in this year that M. Milne became seriously interested in welding; he was exhibiting an acetylene generator for the design of which he had been responsible.

Fusion welding seemed to be the solution to many problems, and in 1911 Mr. Milne formed his own business and other firms came into the field shortly afterwards. It was, however, no easy matter to convince people of the advantages of the new process of fusion welding.

Engineers tended to be more conservative 40 years ago than they are today and were, in the main, sceptical of these new notions, which cut right across all established practice. The engineering periodicals in their turn showed no great interest or enthusiasm about these new methods. Dissemination of knowledge of what could be done and of the best ways of doing it was consequently meagre, and those who saw a future in fusion welding had to feel their way individually.

The first marked progress in welding and the new methods came in the 1914-1918 war, when it was found that the mass production of such war materials as floats for submarine nets and mine cases could be far more rapidly, and sometimes more cheaply carried out by welding with semi-skilled labour than similar riveted equipment could be manufactured.

In 1923 the Institution of Welding Engineers was formed to represent the interests of all systems of welding. This widened the sphere of interest and gave a platform for the rapidly developing technology. Those entering the welding field from that time onwards had opportunities to put forward their views and discuss their welding problems with their fellows at the numerous meetings held by the institution.

The Research Association

As engineers in general became more interested in the possibilities of welding, the magnitude and importance of welded structures and equipment increased rapidly and deeper scientific study became necessary to ensure the safety of many classes of welding fabrication. At this point the Institution of Welding Engineers was reconstituted as the Institute of Welding and inaugurated a welding research council within its compass, so that welding problems could be impartially investigated. Later it became necessary to separate the research side from the institute in order to retain the very considerable financial assistance given to research by the Government. This led to the formation of the British Welding Research Association.

STEEL PLAN ABANDONED

Production Increases Defence

THE halting, or at least postponement, of general schemes to increase production in iron and steel undertakings because of impending nationalisation is further illustrated by a decision of the Staveley Iron and Chemical Company.

The directors, in view of the fact that their company is cited in the schedule of the Iron and Steel Act, have decided not to proceed with the comprehensive scheme to extend the blast furnaces and the by-product plant.

This decision was reported by Mr. David N. Turner, chairman of the Staveley Coal and Iron Co., Ltd., at that company's annual meeting last week.

The consolidated profits of the Staveley Coal and Iron Co., for the year ended June 30, were £1,359,936 compared with £1,303,061 the previous year. In his speech, Mr. David N. Turner said that the accounts showed that over 60 per cent of the profits of the group last year was derived from the Iron and Chemical Company. Nearly 70 per cent of the capital and reserves of the group was represented by the assets of that company.

The output of pig iron had again been a record in spite of the fact that one furnace was out of blast for relining for nine weeks. The coke oven and chemical departments had worked well.

At the British Soda Company the new evaporator plant was started up in March and was not yet in full production owing to various engineering difficulties which had not yet been fully corrected.

The only subsidiary company results of which had not come up to expectations was Birmingham Chemical Co., Ltd. A reorganisation was being carried out there.

Steel Expansion Suspended

Reorganisation of the smaller mills at its Monway Steel Works which had been almost completed, is to be suspended by The Patent Shaft and Axletree Co., Wednesbury, in view of the impending nationalisation of the steel industry.

Morocco Cobalt for U.S.A.

The Economic Co-operation Administration has announced that, by a new arrangement with the French Government, America will obtain some 7200 tons of critically-needed cobalt ore from French Morocco. Cobalt is used in special alloys such as permanent-magnet, high-temperature and high-speed steels.

MORE METAL CUTS

U.S. Conservation of Cobalt

CIVILIAN consumption in the U.S.A. of three basic materials widely used in consumer goods, copper, aluminium and nickel, is scheduled to be reduced by 20 to 30 per cent, the National Production Authority has announced. The use of a fourth metal, cobalt, important in the production of electrical appliances, radio and televison sets, may be reserved for military and defence needs.

In announcing the plans to cut the use of these metals NPA Administrator W. H. Harrison said that regulations making the cuts effective would probably be issued in several weeks; it is unofficially expected that the cuts will become effective on December 1. The regulation will not restrict the allocation of whatever is available among the many user industries.

Steel Industry Trend

THE future trend of developments in the steel industry in Scotland was oulined by Mr. W. Barr, director and chief metallurgist, Colvilles, Ltd., when he spoke at the West of Scotland Iron and Steel Institute. He anticipated a trend towards four-high mills to meet the growing demand for wider thin plates for welded ship construction. Another major problem lay in the power industry where demand for border shell plates of up to 5 in. in thickness was becoming fairly common. The manufacture of such plates, to withstand increased stresses, was fraught with difficulties. Low alloy high-tensile weldable steel was the subject of continuing research for high-pressure vessel manufacture.

African Nickel, Copper and Cobalt

DEVELOPMENT work was now in progress in the Mount Ayliff area of Pondoland, South Africa, where, from the assay results of boreholes made by eminent geologists, there appeared to be extremely promising deposits of nickel, copper and cobalt. This was stated by Mr. J. H. Wormell at the annual general meeting of the Aurochs Investment Co., Ltd., in London, last week. The increased prices of these base metals should be very helpful to their company. Copper, whch during the war was £57 a ton, was now £202 per ton; nickel during the last three months had increased in price from £321 to £386 per ton; and cobalt, which was becoming greater in demand, was now £1120 per ton.

THE SEPARATION OF URANIUM

Mineral Technique Developed by the CRL

IN recognition of the heightened need for analyses of uranium-bearing minerals the Chemical Research Laboratory (Department of Scientific and Industrial Research) issued last week a handbook* giving practical recommendations for the separation and determination of the element. Working details of the separations are given, as well as the quantitative methods to be employed.

Among the general principles discussed is the method of obtaining a solution of the ore for analysis. This depends upon how readily the ore can be decomposed.

Treatment of Ores

Pitchblende ores decompose readily in mild treatment with nitric acid, whereas refractory ores such as the uranium-bearing niobates, tantalates and titanates require more drastic treatment, such as fusion with alkali hydroxide or carbonate.

Even with the more soluble ores, a small amount of insoluble material usually remains unattacked in acid. Further treatment of this insoluble fraction with hydrofluoric acid, or fusion with alkali, is therefore necessary. The entire sample should be brought into solution to avoid loss of uranium in any discarded fraction.

Pitchblende, uraninite, torbernite and autunite are examples of ores which are usually almost completely soluble in dilute nitric acid or in a mixture of nitric and hydrofluoric acids. The more refractory ores which usually require fusion with alkali or potassium bisulphate include euxenite, samarskite, monazite, thorite.

It frequently happens that the ore submitted for analysis contains only a relatively small amount of uranium, together with a large amount of siliceous matter. Such ores may often be decomposed by treatment with nitric acid in the presence of hydrofluoric acid.

The procedure employed for the initial breakdown and solution of a mineral product may influence the choice of method adopted for subsequent separation and purification of uranium in solution. For example, in the ether-liquid extraction procedure for the separation of uranium from the sample solution, sulphate ions must be absent; if the decomposition of the ore involved the use of sulphuric acid or potassium bisulphate it is therefore necessary to introduce an intermediate stage for the separation of the sulphate ion.

Fusion with excess of potassium hydroxide at a high temperature for one hour will decompose any mineral product likely to be submitted for examination. This, therefore, is a general method for ore breakdown. It is not necessary, of course, when simple acid treatments are sufficient.

Other reagents used for decomposition of ores are sodium peroxide, potassium hydrogen fluoride, sodium or potassium bisulphates (pyrosulphates), and sodium and/or potassium carbonates.

One of the methods used for the separation of metallic or other ions present in solution with uranium, following the decomposition and solution of the ore sample, is the standard chemical method.

Chemical Method of Separation

This gives good results and is particularly suitable for high grade uranium products, but it takes rather a long time. The following chemical processes are involved:

(1) The solution of the ore, which should contain sulphuric acid, is evaporated until fumes of sulphur trioxide are evolved.

(2) The mixture is cooled and a mixture of hydrobromic acid and bromine is added, the solution being again boiled to fumes of sulphur trioxide; a number of metals forming volatile bromides (As, Sn, Se, etc.) are then largely removed.

(3) The mixture is diluted and treated with hydrogen sulphide under slight pressure for some hours; the sulphides of a number of metals (Pb, Hg, Cu, Cd, As, Sb, Sn, Mo, Pt) are then formed and separated.

(4) The solution from sulphide precipitation is fully oxidised by boiling to fumes of sulphur trioxide with addition of perchloric acid, potassium permanganate or persulphate solution.

(5) The solution is cooled and treated with cupferron (ammonium nitrosophenyl hydroxylamine); the complex salts of ferric iron, titanium, vanadium and zirconium are then formed and extracted by shaking with chloroform.

The solution is now free from all metals which interfere with the final volumetric determination of uranium. A colorimetric finish cannot be readily employed with

* Handbook of Chemical Methods for the determination of Uranium in Minerals and Ores (1s.)

this method, since certain metals (rare earths, Mn, Th, etc.), are not entirely removed; they do not, however, interfere with the volumetric method. If cobalt and nickel are present in appreciable quantities, electrolysis with a mercury cathode is included before the volumetric determination. The fact that the separation procedure does not yield a pure uranium solution limits the scope of this standard procedure considerably.

The liquid-liquid solvent extraction method is based on the quantitative extraction of uranium as uranyl nitrate by ether, from aqueous solutions containing metal nitrates and free nitric acid. The method gives satisfactory results with practically all types of ores over a wide range of uranium concentration. It is recommended for general use as being reasonably rapid, clean and accurate.

The process includes the following stages:—

(1) The solution of the ore in nitric acid medium, free from sulphate and halogen ions, is mixed with a saturated solution of a mixture of ferric, calcium and ammonium nitrates which improve the partition coefficient of the metal nitrate in the organic solvent.

(2) The aqueous mixture is then extracted with ether. This may be done by hand shaking in separating funnels or in a continuous solvent extractor.

(3) The ether solution, which contains the whole of the uranium and small quantities of other metal ions, such as ferric iron and vanadium, is diluted with water and the solvent removed.

(4) Traces of organic matter are destroyed by evaporating with sulphuric acid and perchloric acid.

(5) The solution is diluted with water and the small amounts of ferric iron, vanadium and other impurities removed by treatment with cupferron and chloroform. After removal of organic material by evaporating with perchloric acid, the solution, which contains practically pure uranium, is ready for final determination by volumetric, colorimetric or polarographic procedures.

Ether Extraction Method

The method of extraction with ether cannot be used when large amounts of sulphate ions are present. Thus, if sulphuric acid or potassium bisulphate is used for the decomposition of the ore it is necessary to make an intermediate precipitation of the uranium as hydroxide. The presence of phosphate ions in the sample inhibits extraction of uranium by ether, but this effect is overcome by increasing the amount of ferric nitrate added to the solution before extraction, the addition of calcium nitrate then being omitted to avoid separation of any insoluble calcium phosphate.

A Rapid Process

A useful and rapid method developed at the Chemical Research Laboratory for the separation of uranium from a large number of other elements is that of solvent extraction in combination with a cellulose adsorbent. The method is based on the observation that uranyl nitrate in ether containing nitric acid (5 per cent) is not adsorbed by cellulose but passes through a column packed with this material whereas the majority of other elements are strongly adsorbed or move down the column only slowly. In this way an ethereal eluent containing substantially pure uranium is obtained in quantitative yield and the element can be determined by a suitable procedure without further separation. The method used is as follows:—

(1) The sample in concentrated solution containing 25 per cent nitric acid, is soaked up in a portion of cellulose pulp.

(2) This is then transferred to the top of a column of cellulose previously prepared by agitating cellulose pulp with ether containing 5 per cent nitric acid, the pulp being allowed to settle in a glass tube so as to form a smooth continuous column.

(3) Ether containing 5 per cent nitric acid is passed through the column to extract the uranium.

(4) The ether eluent is diluted with water, the solvent evaporated and the uranium determined by volumetric, gravimetric, colorimetric or polarographic procedures. The method is suitable for routine use at any concentration of uranium in minerals and ores.

A micro method using solvent extraction in combination with absorbent paper strips is useful either as a qualitative test or for a quantitative determination of very small amounts of uranium. The procedure is as follows:—

A measured volume of the solution to be tested, in nitric acid solution, is placed near the top of a strip or sheet of absorbent paper, such as Whatman No. 1 filter paper. The test spot is allowed to dry in air and the top end of the paper is immersed in an organic solvent, such as ethyl acetate or tetrahydrosylvane, containing a small amount of nitric acid. The strip is arranged to hang vertically in a suitable vessel such as a gas collecting jar; the solvent then diffuses downwards through the paper and over the test spot.

(continued at foot of next page)

Diminishing Non-Ferrous Metal Stocks

A GENERAL decrease in stocks of non-ferrous metals in the United Kingdom in September is revealed in the data supplied by the British Bureau of Non-Ferrous Metal Statistics.

Closing stocks at the end of the period compared with September, 1949, were: blister copper 41,626 tons (53,663); refined copper 78,762 (91,573); tin 8196 (15,872); zinc concentrates 43,071 (36,239); slab zinc 48,414 (73,862).

Production showed an improvement in most categories. Primary refined copper, for example, totalled 14,381 tons (11,691) and English refined lead 6550 (2435).

Exports of tin were greatly increased—1118 tons compared with 553 tons in September last year.

UNWROUGHT COPPER

	Long Tons Blister Copper	Long Tons Refined Copper
OPENING STOCKS:		
Govt. and consumers'	47,338	78,810
Imports	7,354	19,108
PRODUCTION:		
Primary	—	14,381
Secondary	1,712*	7.072
CONSUMPTION:		
Primary	14,531	31,712
Secondary	—	14,426
Exports	2,377†	27
CLOSING STOCKS:		
Govt. and consumers'	41,626	79,762

* Rough copper.

† Includes 1126 tons of rough copper despatched to Belgium and 1251 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	27,331 long tons
Alloyed copper products	26,686 ,, ,,
Copper sulphate	4,910 ,, ,,

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	48.2

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	529
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	341

UNWROUGHT ZINC

	Long Tons Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers'	44,731	54,662
Imports	6,501	11,014
PRODUCTION:		
Virgin and remelted	5	6,578
CONSUMPTION:		
Virgin (incl. debased)	8.166	23,334
Remelted and scrap	—	7,650*
Exports and re-export	—	3
CLOSING STOCKS:		
Govt. and consumers'	43,071	48,414

* Includes a small quantity of zinc concentrates consumed directly for chemicals, etc., which is also included as consumption of concentrates.

LEAD

Long Tons	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers'	—	75,189	6,118	—
Other stocks ...	55	—	—	—
IMPORTS	—	4,874	—	69
PRODUCTION	262	—	6,550	—
CONSUMPTION ...	262	15,637	5,564	7,802
EXPORTS	—	25	—	—
CLOSING STOCKS:				
Govt. and consumers'	—	64.105	7,104	—
Other stocks ...	55	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	8,196
IMPORTS	500
PRODUCTION	—
CONSUMPTION	1,841
EXPORTS AND RE-EXPORTS	1,118*

* Exports total 1118 tons, of which to U.S.A., 204; Germany, 201; S. America, 136; Egypt, 111; Syria (Lebanon), 71; Sweden, 52; France, 50; Hungary, 50.

THE SEPARATION OF URANIUM

(*continued from previous page*)

Uranyl nitrate in the sample is dissolved by the organic solvent and moves down the paper with the solvent front as diffusion proceeds, whereas other metals either remain stationary or move only slightly in comparison with the uranium. After the solvent has moved a few inches past the test patch, the strip is removed and the solvent allowed to evaporate.

For quantitative determination, the portion of the paper strip containing the uranium is cut out, this section of paper being ashed and dissolved in acid. Uranium is then determined in the acid solution by the polarograph.

Technical Publications

CHANGES to the "Model Safety Rules for Use in Chemical Works, Part I," made necessary by the Factories Act, 1948, and a few minor alterations suggested by experience, have now been listed by the Association of British Chemical Manufacturers. The amendments are issued in the convenient form of gummed slips for insertion in the blank pages provided in the existing rules. Copies of this first supplement are being sent to all known purchasers of the original edition of Part I.

* * *

CHEMICAL and welding operations sometimes involve the production of fumes in close proximity to the worker, who may be obliged to inhale some of them while they are hot and relatively concentrated. A new appliance, the Pyrobit (Acru Electric Tool Manufacturing Co., Ltd., Manchester), is a combined ventilation and work-illuminating device comprising an air duct and an electric lamp which provides light and the heat required to create a chimney effect capable of withdrawing fumes from the work and dispersing them in diluted form above the level of the worker's head.

* * *

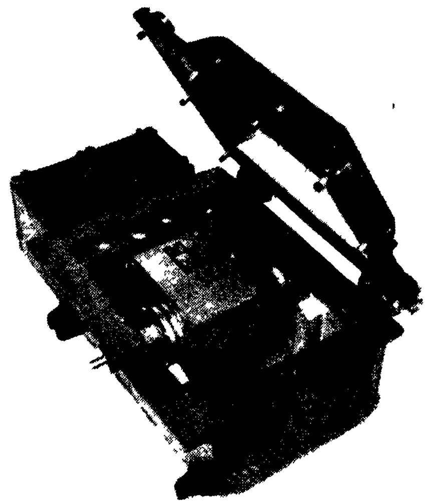
A BOOKLET of more than 100 pages on the uses of 50-odd different alloys and metals in the manufacture of steel and certain non-ferrous metals has been issued by the Electro Metallurgical Division of the Union Carbide and Carbon Corporation, New York. Interesting historical facts concerning the discovery and development of the principal alloying elements—chromium, manganese, silicon, calcium, vanadium, tungsten, zirconium, columbium, boron, and titanium—are included, with a brief description of their properties and uses. A separate catalogue deals with stainless steels and their uses and gives much technical data.

* * *

RECENT technical literature on the various applications of zinc and its products are summarised each month in "ZDA Abstracts," issued by the Zinc Development Association. The abstracts are classified under headings: die casting, finishing, coating, galvanising, chemistry of zinc, etc. The most recent issue is Vol. 8, No. 9, abstracts 774-865.

* * *

REDUCTION of wear and tear on conveyor belts is of considerable importance in order to reduce costs. A useful handbook on the "Maintenance and Preservation of Belting" has just been issued by Richard Sutcliffe, Ltd., Wakefield, manufacturers of mechanical handling equipment.



[By courtesy of Londex, Ltd.

A new pressure switch adapted for use in semi-automatic systems depending upon a continuous flow or level in situations where there may be inflammable vapour. The switch is in a flame-proof enclosure with overall dimensions of 17 in. by 10½ in. by 6¾ in.

* * *

BASIC information about voltages and electrical plant in any district or country is given in the "Annual Tables of Electricity Undertakings of the World," (price 30s.), just published by *The Electrician*, 154 Fleet Street, London, E.C.4. The volume contains much useful data in non-technical terms and, as a new feature, a "Who's Who" of members of the British Electricity Authority.

* * *

INSIGHT into the needs and interests of the commercial community of South Australia is afforded by the reorganised and improved "Trade Digest" issued by the Adelaide Chamber of Commerce, of which the current issue reflects the heightened interest in the technology of plastics moulding materials.

OVERSEAS CHEMISTRY AND INDUSTRY

GERMAN RESEARCH & PRODUCTION

"Prestige and National Importance Nearly Regained"

THE renewed recognition of the importance of German industrial chemistry was evident in the support given to the last annual general meeting, in Frankfurt, of the German Society of Chemical Industry (Ges. Deutscher Chemiker) and in some of the developments then revealed.

A report in *Angewandte Chemie* (62 (19), 448-468, October 7) states that over 3000 chemists, including many from abroad, attended the proceedings.

Need for Unity

In his opening address, Dr. K. Ziegler noted that the society had at length nearly regained its former prestige and national importance, quite in the old tradition, but its rehabilitation could not be completed while the country was divided into two parts. Meanwhile its efforts in the immediate future towards the further restoration and advancement of German chemical industry must be applied more particularly to the rebuilding and staffing of the various schools and chemical institutes, with special reference to those in the province of Hesse, which included those at Frankfurt/a/M., Darmstadt, Giessen and Marburg.

The importance of Hesse as a centre of chemical research and industry was further emphasised by Dr. J. Newman, representing the high commission of that province. He said that, out of a total export value of Dm. 237.4 million from Hesse in 1949, Dm. 20 million was represented by chemical products. These figures appeared likely to be greatly exceeded in 1950, for in May alone chemical exports were valued at Dm. 25 million out of an export total of Dm. 105 million.

Dr. B. Rajewsky, rector of the Johann Wolfgang Goethe University, Frankfurt a/M., reporting on the work of restoration there, said the large new hall of the chemical institute was now ready for occupation.

The society's Emil-Fischer medal for the year was awarded to Dr. H. Meerwein, of Marburg (Hesse), for noteworthy research in molecular interchange and the mechanism of chemical reaction, leading to a comprehensive theory of homogeneous catalysis. The Justus-Liebig medal was given to Dr. Erich Konrad, of Leverkusan, for fundamental scientific research in synthetic rubber and its applications, including the development of Buna.

As a memorial to the work of Dr. Alfred Stock in the sphere of chemical education, a foundation was established by friends, scholars and the GDCh, to be administered by trustees. A gold medal and prize of Dm. 1000 was agreed to be given each year for the best work in inorganic chemistry under specified conditions, as adjudicated by the GDCh and beginning with this year, when the prize-winner was Dr. Egon Wiberg, of Munich, for his research in boron compounds and hydrides. Dr. H. O'Daniel, dean of the science faculty, Frankfurt University, addressed laudatory remarks to a French colleague, Jean Roche, who, he said, was one of the most famous biochemists and a friend of German chemical research.

Membership of the society was reported to have increased satisfactorily to the present figure of 5200—about 1000 more than 1949. Local sections had grown and now numbered about 30. More than 350 scientific papers had been read to them during the past year. The technical groups also had extended their activities and now included a new group concerned with patents and trade marks law.

Dr. Paul Karrer, well known author of the widely used organic chemistry textbook, who represented Switzerland, greeted the assembly on behalf of the foreign visitors and of the Swiss Chemical Society. He emphasised the importance of reviving and fostering international relations in the chemical world and mentioned the interchange of students taking place between Germany and Switzerland.

The numerous papers covered a wide range of subjects, particularly in the fields of organic and biochemistry, and dealt with water, plastics, rubber, food, textile chemistry, and patents laws.

Greek Glass Industry Development

The Sté de Produits Chimiques et d'Engrais of Athens, is to enlarge its glass plant with the help of Marshall Aid. Automatic machines will be installed which are expected to reduce costs and nearly double the production. Output has so far been only sufficient for domestic requirements.

COMMERCIAL CORTISONE

Rising Production in U.S.A.

THE possibility that the U.S. drug industry will eventually produce large quantities of cortisone was predicted at a meeting of State and territorial health authorities in Washington, D.C., by Dr. Erich Mosettig, of the National Institute of Health. He said that a great deal of progress had been made in synthesising Compound E (at present made only from ox bile) from yams, smilax, soya beans and the African flower strophanthus. The price of cortisone had dropped sharply in recent months from $250 a gram to $32. It now costs only one-tenth of last year's price.

The supply of cortisone is, in fact, so well established that Merck Company, Rahway, New Jersey, states it has a sufficient quantity of the drug on hand to enable sales to be made " over the counter " with a doctor's prescription.

It is still considered one of the most promising drugs developed for the treatment of a number of diseases, including rheumatic heart ailments. According to Dr. Luther Terry, chief of the Experimental Therapeutics Section of the National Institute of Health, there are in the U.S.A. at least 800,000 in the latter group.

Two More Antibiotics

ADDRESSING a meeting of the American Institute of Chemical Engineers in New York, Mr. John E. McKeen, president of Charles Pfizer and Co., Inc., has announced the production of two new antibiotics that may have industrial as well as therapeutic uses. They have been named Thiolutin and Netropsin. Preliminary tests on Thiolutin indicate that it may be effective in combating fungi, and Netropsin is said to show great promise as an insecticide, particularly against clothes moths and carpet beetles.

The new antibiotics bring to four the number of such materials developed by the Pfizer company in the past year. A few months ago the company announced the development of Terramycin and Viomycin. The latter is now being clinically tested as a specific against tuberculosis.

Iranian Drug Imports

The Government of Iran has abolished customs duties on a number of drugs and preparations, including quinine, stabrine, paludrine and others used against malaria; all the antibiotics; bismuth and arsenical compounds used against venereal diseases; and insecticides.

RECORD SULPHUR TOTAL

Mounting Yields in the U.S.A.

THE American domestic sulphur industry may attain the highest production ever recorded in 1950. During August, the Bureau of Mines reports, the domestic sulphur industry produced 436,612 long tons of native sulphur, which, although 29,451 tons less than July's total, was 39,588 tons more than was produced in August last year. Total production for the first eight months of 1950 was 3,446,118 long tons, well above the corresponding period in any previous year. In January-August, 1949, production totalled 3,169,308 tons. Deliveries from the mines in the eight-month period in 1950 were 3,574,412 tons as compared with 3,175,163 tons in the same period of 1949.

Brazil to Use Pyrites Source

Brazil, which has no natural sulphur deposits, and which is almost entirely dependent on foreign sources to supply her sulphur needs, is expected soon to be able to produce about 50,000 tons of sulphur yearly from pyrites from coal. This would be sufficient to fill the country's domestic needs. This estimate is based on the 40-45 per cent content of pyrites in Brazilian coal, of which about two million tons are mined annually.

Hungarian Anti-TB Drug

THE Hungarian pharmaceutical industry claims to have successfully synthesised p-acetyl aminobenzaldehyde thiocemicarbazone, a well-known anti-tuberculotic agent. The new drug, produced under the trade name of Thiomicid, is said to be highly effective. Thiomicid is the third anti-TB drug produced in Hungary since the war.

The first results in the use of Thiomicid proved very promising, states the Hungarian News and Information Service. A large amount of information concerning its effectiveness has since been collected. Clinical experiments are stated in Hungary to have demonstrated that a dilute solution of Thiomicid—1 : 500,000—has a bacteriostatic effect more marked than that of streptomycin. It is claimed that after the administration of 100 mg. of Thiomicid no Koch bacilli could be found in the spleen.

Current clinical practice of Thiomicid treatment has been extended to tracheal and bronchial-TB, tubercular infection of the kidneys, bones and joints, skin TB, and fistulas of the lymphatic glands. It can be administered for several months generally without adverse side-effects.

OVERSEAS

U.S. Titanium in 1949

The record total of 4.2 million lb. of titanium was used in steel making by U.S. mills in 1949, according to the American Iron and Steel Institute.

Fertiliser Values

The Minister for Agriculture in the Republic of Ireland has made an Order providing that a tolerance of 1 per cent may be permitted in statements covering the analysis of artificial fertilisers.

Cement Plant for Brazil

A Bill now before the Brazilian Congress proposes that exemption from duty be granted for imports of cement-mill equipment with the object of encouraging the domestic production of cement, of which there is a shortage in the country.

Italian Expansion

The Montecatini Company has announced an increase of 20 per cent in the production of sulphuric acid during 1949. Superphosphate production capacity was increased to 90 per cent of pre-war production. New nitrogen fertiliser workshops were opened at Novara and will be in operation shortly, using natural Lombardy gas for fuel.

India Defers N-F Price Control

The Government of India does not at present propose to fix ceiling prices for non-ferrous metals, it has been announced in New Delhi. The Government, however, is keeping a "close watch" on the situation, and "will prescribe maximum prices if prices show a tendency to rise unduly." Indian prices have shown an upward tendency in recent weeks. The Government, however, is satisfied that the current prices are not unreasonable.

New Portable Dust Detector

Two Scandinavian engineers have produced a simple portable instrument for measuring the amount of dust in the atmosphere. Although no new principles are involved in its design, it is thought that this hand instrument may be valuable for checking the ventilating system in factories where dangerous dusts are produced. A sample of air is drawn into the field of view of a small microscope. With a "dark ground" illumination provided by a bulb run off a battery any dust particles appear as spots of light in the microscope.

Much More Methane Gas

In the first half of this year Italy's output of methane gas amounted to 202 million cu. m. as compared with 87 million cu. m. in the same period of last year.

Norwegian Hydro-electric Power

Since 1945 the amount of electricity produced annually by hydro-electric sources in Norway has increased from 10,000 million kW hours to over 16,000 million kW hours.

French Chemicals: Reduced Totals

Production figures for July show a general decline in French industrial output compared with June. Sulphuric acid is down from 98,000 tons to 95.000 tons; soda carbonate from 53,000 to 45,000 tons. No chemical or fertiliser production has, in fact, increased.

Bolivia and German Patents

The Government of Bolivia has re-established the validity of laws of 1916 and 1918 in respect of German trade marks whereby those which had been declared invalid in 1944 and 1945 may again be registered and the import of goods bearing these is again permissible.

Indian Sugar

The Government of India has fixed prices of sugarcane and sugar at the same level as last year—Rs. 1-10-0 and Rs. 28-8-0 a maund respectively. To meet the requirements until the end of December it is necessary to produce about 100,000 tons of sugar in India before December 15.

Australian Nitrate Subsidy Urged

The Federal Department of Agriculture has recommended to the Australian Government that a subsidy of £A4 per ton be granted for the import of sodium nitrate to bring it into line with the subsidy for sulphate of ammonia. Last year Australia imported about 144,000 cwt. of sodium nitrate, mostly from Chile, at a cost of £A10,000.

Swiss Chemical Exports Revival

Official Swiss export trade returns show that shipments of chemical and pharmaceutical products and of dyestuffs amounted to (million Swiss francs) 52.7 in September, as compared with 48.7 in August. Noteworthy is the further rise in the value of dyestuff exports to 20.7 (18.4), which is only 0.1 below that of pharmaceutical products.

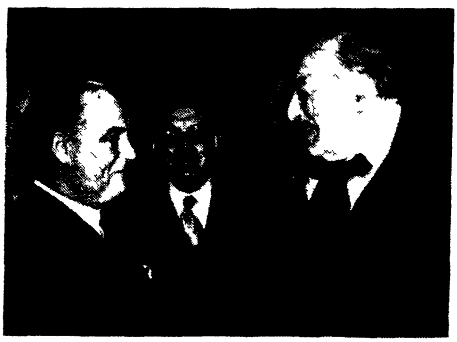
· PERSONAL ·

MR. G. M. MICHIE has joined the research and development division of the British Steel Founders' Association in a senior executive capacity. For the past two years he has been senior research metallurgist in charge of the research laboratories at Penistone of David Brown & Sons (Huddersfield), Ltd., and is known for his work on the development and application of non-destructive testing of steel castings.

SIR LEWIS FERMOR has been elected president of the Institute of Mining and Metallurgy for the 1951-52 session. He served with the Geological Survey of India from 1902 until his retirement as director in 1935, and has since been engaged as a consultant in India, Malaya and other far Eastern countries.

MR. R. E. POWELL and MR. J. A. DULLES have been appointed senior vice-presidents of Aluminium, Ltd. Mr. Powell is a director of the company and president of its principal subsidiary, the Aluminium Company of Canada, Ltd. Mr. Dulles is a member of the board and secretary of Aluminium, Ltd.

One of American chemical industry's principal honours, the Chemical Industry Medal for conspicuous service to Applied Chemistry, was awarded to MR. WILLIAM M. RAND, president of the Monsanto Chemical Company, St. Louis, by the American Section of the Society of Chemical Industry in New York City on November 3.



Sir Herbert Merrett (left) being congratulated by Lord Brassey on his election to the chairmanship of Powell Duffryn, Ltd., in succession to Mr. Edmund L. Hann

Mr. C. G. Hayman, the newly appointed chairman of the ABCM, is a director and a member of the management committee of the Distillers Co., Ltd., the board of which he joined in 1936

MR. R. L. TAYLOR (Johnsons of Hendon, Ltd.) was elected a Trustee at the annual meeting in Buxton of the Association of British Pharmaceutical Industry. Mr. Taylor was first elected to council in 1937, was president of the Association 1949-50.

The winners of the Nobel Prize for medicine are announced as DR. E. C. KENDALL and DR. P. S. HENCH, both of the Mayo Clinic, Rochester, Minn., U.S.A., and DR. T. REICHSTEIN, of the University of Basle, Switzerland. Dr. Reichstein discovered the drug cortisone, while Dr. Kendall and Dr. Hench succeeded in finding its practical clinical uses.

SIR JOHN COCKCROFT, director of the Atomic Energy Research Establishment, Harwell, is among those on whom honorary degrees will be conferred at the University of London Foundation Day celebrations to-day (November 4).

Members of the Textile Institute, Manchester, were addressed yesterday by DR. H. F. SCHIEFER, one of its distinguished American members, on the subject of textile research and testing at the U.S. National Bureau of Standards, at which he is a physicist.

Industrial Welfare Appointments

The Institute of Welfare has decided to circulate among experienced welfare officers who have notified their need of a post, details of suitable vacancies sent to the institute by employers.

HOME

Tin Touches £980

Starting firm on October 25, tin prices on the London Metal Exchange made substantial gains to new record prices. On October 31 in the closing session the cash quotation rose by £33 10s. to £979-£980 and that for three months was £25 10s. up at £941-£944.

£1 m. Groundnuts Deficit

Between October, 1949, and early April this year the East African groundnuts plantations provided in the U.K. 753 tons of nuts and 451 tons of sunflower seed. In the year ended March, 1950, the Overseas Food Corporation made an agricultural trading loss of £1,268,254, according to the official report on the second year's work, issued on Tuesday.

International Textile Research

The Textile Institute has accepted an invitation, extended by the Institut Textile de France, to be represented at the 1951 International Congress of Scientific Research Applied to the Textile Industry, to be held at Lille on May 8 and 9, 1951. Dr. D. Traill, a member of the institute's council, will deliver a paper at the congress.

Licences Unnecessary

Freer import facilities for a large group of chemical materials and metals became effective on November 1, resulting from certain alterations made by the Board of Trade in the list of goods which may be imported without individual licences from the countries collaborating to liberalise international trade. Among items freed are chromium, powdered iron, anhydrous carnallite, iron carbonate and perchloride; the following five resins: acrylic, melamine, phenol, cresol and urea-formaldehyde; certain plastics moulding powders.

Chemical Wagons Damaged

A fire in the wagon repair works at Winsford, Cheshire, of I.C.I., Ltd., last week badly damaged 20 railway wagons.

Welding Trends

A demonstration of the latest developments in welding industry research will be opened by the British Welding Research Association at the Engineering Centre, Glasgow, on Monday next.

Revised Prices for Paraffin Wax

A number of revised prices for paraffin wax and scale have been announced by Shell-Mex and B.P., Ltd. Typical prices for one ton lots and upwards are £67 17s. 6d. for grades 100-105° F., 106-110° F. and 110-115° F., and £104 10s. for grade 145-150° F.

Higher Priced Glycerin

An advance in the price of chemically pure glycerin in the U.K. and Eire, as from November 1, is announced by Glycerine, Ltd., which states that the increase has been occasioned by the continued rise in world quotations. Prices now range from 262s. to 225s. per cwt., according to quantity. The previous basic figure, fixed on August 1, was £165 10s.

Coal Production

Output of deep-mined coal fell last week by 28,700 tons. Comparative figures are: Last week: 4,375,600 tons (deep-mined 4,177,700 tons, opencast 257,900 tons). Previous week: 4,389,200 tons (deep-mined 4,146,400 tons, opencast 242,800 tons). Deep-mined coal output for the first nine months of this year was 151,021,800 tons, which compared with 149,195,500 tons during the same period last year. The average weekly output for September was 3,990,500 tons.

Obituary

THE death is announced, at the age of 61, of MR. EDWARD ERIC BILLINGTON, managing director of Edward Billington & Son, Ltd., who was three times president of the Liverpool Seed, Oil Cake and General Produce Association, and during the war years was deputy chairman of the Animal Feeding Stuffs C.i.f. Buyers' Association of Liverpool, Ltd., and a member of the Advisory Committee for the Control of Molasses and Industrial Alcohol.

The death was reported last week of SIR EDWARD JAMES GEORGE, a former president of the British Iron and Steel Federation. Sir Edward, who was 84, retired from the deputy chairmanship of the Consett Iron Company in 1940, a year after receiving his knighthood for services to the industry.

MR. JOHN CHARLES GARLAND, technical director of Streamline Filters, Ltd., has died as the result of an aeroplane accident.

Next Week's Events

MONDAY, NOVEMBER 6

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. (Joint meeting London Section and Food and Agricultural Groups). R. Barrington Brock: " Scientific Aspects of Wine Production."

Oil and Colour Chemists' Association

Hull: Royal Station Hotel, 7 p.m. (With Hull Chemical and Engineering Society). A. R. Old and W. E. Ballard: " Metal Spraying."

Institution of Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. Dr. A. C. Dunningham: " Thermal Efficiency of Combined Heat and Power."

TUESDAY, NOVEMBER 7

Royal Institute of Chemistry

Bolton: Municipal Technical College, Manchester Road, 7 p.m. E. Isaacs: " Industrial Developments in the Polymer Field over the Last Twenty Years."

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 5.30 p.m. (Agricultural Group. Crop Protection Panel). Dr. G. S. Hartley: " Physico-Chemical Problems in the Use of Insecticides."

Society of Dyers and Colourists

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. (Junior Branch). H. B. Bradley (I.C.I., Ltd.): " The Development of a New Dyestuff."

Electrodepositors' Technical Society

Birmingham: James Watt Memorial Institute, Great Charles Street. Dr. H. Saenger: " Storage and Handling of Acids."

WEDNESDAY, NOVEMBER 8

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. (Food Group). " The Significance of Aqueous Vapour Pressure in the Food Industry." F. R. Jones: " An Accurate Method for the Determination of Aqueous Vapour Pressure "; R. W. Money: " The Equilibrium Humidity of Concentrated Sugar Syrups and other Sugar Products "; Dr. J. B. M. Coppock and Mrs. D. E. Cookson: " The Effect of Humidity on Mould Growth on Constructional Materials."

Royal Institute of Chemistry

Aberdeen: Marischal College, 5.30 p.m. (Aberdeen and North of Scotland Section, with the Chemical Society and SCI). Prof. J. W. Cook: " Some Aspects of the Chemistry of Polycyclic Aromatic Hydrocarbons."

Dublin: Trinity College, 7.45 p.m. Mamie Olliver: " A Chemist in the Food Industry."

London: County School, Ridgeway Road, Isleworth, 7 p.m. Dr. J. G. A. Griffiths: " Rockets and Chemistry " (with films).

Manchester: University, 6.30 p.m. (Manchester and District Section, jointly with the Chemical Society and the SCI). Prof. C. E. H. Bawn: " Catalysed Oxidation."

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. Dr. B. P. Dudding: " Metallic Materials Used in the Construction of Lamps and Valves."

Institute of Petroleum

London: 26 Portland Place, W.1, 5.30 p.m. Dr. W. W. Myddleton: " Stability of Mineral Oils in Toilet and Cosmetic Preparations."

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7 p.m. E. F. Burford: "The Design of Pressure Vessels."

THURSDAY, NOVEMBER 9

Royal Institute of Chemistry

Belfast: (Belfast and District Section, with the Chemical Society and SCI). Annual dinner.

Hull: Royal Station Hotel, 7.30 p.m. T. McLachlan: " The Public Analyst and His Work."

Stirling: Golden Lion Hotel, 7.30 p.m. Dr. D. McNeil: " Coal Tar Research."

The Chemical Society

Liverpool: University, 4.30 p.m. (with RIC, SCI and BAC). Prof. F. S. Dainton: " Polymerisation and its Reversal."

Nottingham: University, 6.30 p.m. Dr. L. E. Sutton: " Recent Chemical Applications of Electric Dipole Moment Measurements."

Sheffield: University, 6.30 p.m. (with RIC). Dr. R. J. Holroyd: " Hydrocarbons as Raw Materials for Organic Chemical Industry."

Oil and Colour Chemists' Association

Glasgow: St. Enoch Hotel, 7.15 p.m. G. R. MacFarlane: " Paint Machinery—Latest Developments."

Institution of Electrical Engineers

London: Savoy Place, W.C.2, 5.30 p.m. D. B. Hogg: " Some Notes on Electrical Installations in Large Chemical Factories."

ANALYSTS' CONGRESS

Papers for Paris Meeting

THE Société de Chimie Industrielle, with the collaboration of the Groupement Technique de l'Analyse et des Essais, has now published its programme of the congress of analysts it is organising in Paris from November 20-24.

Among many lectures to be given at the congress is one by a former president of the Society of Public Analysts, Mr. G. W. Monier Williams, in English, entitled "Some Problems of Trace Element Analysis in Foods." Other papers to be read deal with radioactive indicators in analysis, organic reagents in modern chemical and physco-chemical techniques, achieving technical conditions in the laboratory, the applications of X-rays in analysis, and the sensibility of analytical reactions.

Many different laboratories and works will be visited including the Laboratoire Central de l'Armement (section de spectrographie), the Laboratoire Central des Services Chimiques de l'Etat and the Paris municipal laboratory.

NEXT WEEK'S EVENTS
(*continued from previous page*)

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. The Leeuwenhoek Lecture. Sir Paul Fildes: "The Development of Microbiology."

Institute of Metals

London: Royal School of Mines, South Kensington, 7 p.m. Prof. A. J. Murphy: "The Significance of Some Less Common Metals."

FRIDAY, NOVEMBER 10

Royal Institute of Chemistry

St. Andrews: University, 5 p.m. Prof. E. G. Cox: "Bond Lengths: Their Measurement and Significance."

The Chemical Society

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5 p.m. Dr. R. S. Cahn: "Editing for the Chemical Society."

Bedson Club

Newcastle-upon-Tyne: Dr. E. J. Bowen: "Resonance Transfer of Energy between Molecules."

The Royal Institution

London: 21 Albemarle Street, W.1, 9 p.m. Prof. Gordon F. Hull (Professor of Physics, Dartmouth University, U.S.A.): "Microwave and Optical Analogues."

ROYAL SOCIETY OF ARTS

A Survey of British Progress

"ONE Hundred Years of British Progress" is the title of a series of lectures being given during the present session (the 197th) of the Royal Society of Arts, the inaugural address of which was given last Wednesday by Mr. Ernest W. Goodale, chairman of the society.

Other lectures include: "A Century of British Science," by D. McKie, reader, Department of the History and Philosophy of Science, University College, London, on February 14; "Cities Without Smoke" by Albert Parker, director of Fuel Research DSIR (November 22, 1951); the Fernhurst Lecture "Insecticides and their Study," by C. Potter, head of the Department of Insecticides and Fungicides, Rothamsted Experimental Station (January 10).

Among the Cantor Lectures will be three in January (Mondays 8, 15 and 22) on the "Plastics Industry" by John C. Swallow, of the British Plastics Federation.

International Welding Congress

AN international welding congress is to meet in London and Oxford from July 14-21 next year. It will include the annual meeting of the International Institute of Welding and its various commissions, and is sponsored in this country by the five British member societies—the Institute of Welding, the British Welding Research Association, the British Acetylene Association, the welding sections of the British Electrical and Allied Manufacturers' Association and the Sheet and Strip Metal Users' Technical Association. The president of the reception committee is Sir William Larke.

The congress will open in London on July 14, and will be transferred on the following day to Oxford for the remainder of the session. Visitors are expected to number between four and five hundred. Technical papers to be presented and discussed will include: "The Welding of the Wrought Light Alloys," (chairman, Sir Arthur Smout); "The Welding of Bridges and Allied Structures" (chairman, Professor J. F. Baker, Cambridge University); "Present Trends in British Welding."

A programme of social events and a concluding banquet at the Savoy Hotel, London, will form part of the arrangements and a number of works visits will be paid in the week following the congress.

The Stock and Chemical Markets

WITH the opening of the new Parliament, political factors have tended to influence the markets, which have turned hesitant. British Funds, after earlier gains, have eased, and buying of industrial shares has been more selective than recently. The City argues that the new Chancellor is likely to ask for dividend limitation to be continued in 1951. On the other hand, as higher taxation seems inevitable next year, few companies, in any case, will be able to pay more to shareholders in the future. It is recognised, however, that there are many companies with reasonable prospects of maintaining their dividends, and in most cases their shares offer attractive yields at current prices.

Earlier in the week there was an easier trend in chemical shares, pending news of the Government's plans for the new session of Parliament. Imperial Chemical, for instance, have eased to 42s. 4½d., and Fisons to 27s. 9d. Monsanto were 51s. 3d., Albright & Wilson 30s., while W. J. Bush rose further to 88s. 9d. Laporte Chemicals 5s. units were 10s. 4½d., Boake Roberts, 31s. 6d., Brotherton 10s. shares, 20s. 6d., F. W. Berk were 12s. 6d., and Amber Chemical 2s. shares, 2s. 9d. L. B. Holliday 4½ per cent preference were 19s. 9d. and Woolley 4¾ per cent debentures, 104½.

Dunlop Rubber came back to 68s. 6d. on the company's new capital plans and British Oxygen, which is also making a big increase in capital, were 91s. Several leading industrial companies are expected to require more money before the end of the year for expansion purposes, and also to finance stocks, because of increased prices of raw materials. The market believes that the full British Celanese results, or annual meeting, may provide news of the company's capital plans.

Turner & Newall, at 85s. 6d., showed firmness on talk of higher dividend possibilties, but United Molasses eased to 47s. 3d. after their recent rise. The 4s. units of the Distillers Co. were 19s. 7½d. and Boots Drug showed firmness at 49s. 6d. Lever & Unilever have been steady at 44s., but British Aluminium eased slightly to 43s. 9d. and Associated Cement to 84s.

United Glass Bottle, at 76s. 3d., remained firm and Triplex Glass, at 27s. 6d., regained part of an earlier small decline. Iron and steels were generally steady, with Guest Keen more active around 46s. 9d. and Staveley firmer at 84s. 3d. on the statements at the meeting.

Glaxo Laboratories changed hands around 52s., Beechams 2s. 6d. deferred units were 14s. 6d., British Glues moved up to 21s. 9d., British Match remained at 38s. 6d. and Borax Consolidated have been firm and well maintained at 55s.

British Celanese, at 24s. 3d., were fairly steady, awaiting the full results and chairman's annual statement. Courtaulds have eased to 40s. on some disappointment with the unchanged interim dividend, although this does not necessarily rule out an increase in the final dividend. On the last occasion the chairman pointed out that it was only after much consideration that the directors agreed to continue a policy of dividend limitation.

Oil shares have been uncertain, with Shell at 62s. 6d. and Anglo-Iranian £6 5/16.

Market Reports

FIRM price conditions have characterised most sections of the industrial chemicals market during the past week and such adjustments as have been made have been towards higher rates. Delivery specifications are fully up to schedule and buyers are already showing interest in contract replacement business covering the first half of 1951. Export trade, too, has been fully maintained, especially for Empire destinations. There has, unfortunately, been no improvement in the supply of drums and the acute shortage of containers is still a serious hindrance to export trade. In the coal tar products market the chief alteration is a rise of 9d. per gallon on cresylic acid and it is understood that ADF cresylic is commanding $1.15 per American gal. Phenol is now quoted at 1s. 1d. to 1s. 3d.

MANCHESTER.—Prices have remained steady in the Manchester chemical market with fairly active trading conditions during the past week. Textile dyeing and finishing chemicals are meeting with a good demand and steady pressure for supplies has been experienced from most other leading industrial outlets. There have been a fair number of fresh inquiries for a wide range of products, including the alkalis and the potash compounds. Manufacturers continue to receive a steady flow of orders on both

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BARCLAY-STUART (PLASTICS), LTD., London, E.C. (M., 4/11/50). October 2. £2500 further charge to English Estates Assurance, Ltd.; charged on land 25 and 27 Brunswick Street, and the site of 16 to 26 Duke Street, Luton, together with buildings and factory premises thereon. *Nil. December 31, 1949.

Satisfaction

LAWRENCE (BRIGHTON), LTD., chemists. (M.S., 4/11/50). Satisfaction October 6, of deb. reg. March 9, 1059.

Company News

Dunlop Rubber Company

Very steep rises in the prices of rubber and cotton have influenced the Dunlop Rubber Company to seek authority to raise fresh capital and to increase its present borrowing powers. An extraordinary general meeting of shareholders on November 13 will be asked to authorise the issuing of any of the 21,650,930 ordinary shares of 6s. 8d., at present unissued, and to fix the total amount which may be borrowed by the parent company at £20 million.

Mixenden Mills, Ltd.

The Mixenden Carbonizing Co., a branch of Henry Cullingworth & Sons (Bradford), Ltd., has been formed into a private limited company under the title of "Mixenden Mills, Ltd." The board has been strengthened by the addition of Mr. R. E. Tranter, who has been manager of the company for 31 years.

Change of Name

The name of HOCKLYKEM, LTD., of 1 Hockley Hill, Birmingham, has been changed to HOCKLEY CHEMICAL CO., LTD.

Increases of Capital

The following increases of capital have been announced: DURHAM CHEMICALS, LTD., from £140,000 to £190,000; ALBRIGHT & WILSON, LTD., from £1.5 million to £5.5 million (THE CHEMICAL AGE, 63, 304).

New Registrations

A. J. Berthier & Sons, Ltd.

Private company. (487,065). Capital £1000. Manufacturers, importers and exporters of essential oils and raw materials for the perfumery trade, etc. Subscribers: E. A. Smee and F. E. H. Smee. Reg. office: 1 Morocco Street, Bermondsey, S.E.1.

Gascoigne-Crowther, Ltd.

Private company. (487,570). Registered October 23. Capital £1000. Dealers in detergents, bactericide, chemicals and chemical products, disinfectants, etc., connected with agricultural or other purposes. Directors: Geo. H. Gascoigne (director of Gascoignes (Reading), Ltd., and Harold A. H. Crowther. Reg. office: 42 Bedford Avenue, W.C.1.

Micro-Nutrients, Ltd.

Private company. (487,361). Capital £100. Objects: To acquire licences and other rights in formulae of all kinds connected with industry, and foodstuffs, agriculture, medicine and the production of micro-nutrients, etc. For other particulars see Micro-Nutrients Holdings, Ltd.

Precipitators, Ltd.

Private company. (487,517). Capital £100. Manufacturers and contractors for all types of electrical and mechanical apparatus and equipment for use in connection with cleansing, purifying and refining of gases and liquids, etc. Directors: E. L. Joseph, K. E. Joseph, A. G. T. Oakley and E. F. W. Cowell. Reg. office: The Esplanade, Rochester, Kent.

THE STOCK AND CHEMICAL MARKETS

(*continued from previous page*)

home and export account. There has been a brisk demand for most of the tar products, especially the light distillates.

GLASGOW.—There has been a steady flow of business during the past week in the Scottish heavy chemicals market. A large number of chemicals and raw materials have been subjected to very considerable increases in price, in many instances due to the higher cost of paper bags.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Preparation of dialkyl-substituted dihalogeno silanes. — British Thomson-Houston Co., Ltd. June 11 1948. 645,814.

Sealing of closures for containers.—Dewey & Almy Chemical Co. June 24 1948. 645,818.

Gas-expanded material and method of making same.—United States Rubber Co. Aug. 25 1948. 645,115.

Manufacture of thiopentone.—Geigy Co., Ltd., I. E. Balaban and B. E. Wilde. May 14 1949. 645,117.

Apparatus and method of making tampons.—H. G. Bouly (International Cellucotton Products Co.). Sept. 17 1948. 645,048.

Conditioning of penicillin.—Soc. des Usines Chimiques Rhonepoulenc. Sept. 17 1948. 645,180.

Densitometers.—Evans Electroselenium, Ltd., and G. C. Collins. Sept. 8 1949. 645,050.

Metallurugical processes for producing materials or articles of platinum or allied metals, or their alloys, and materials or articles produced by or from the products of such processes.—Lodge Plugs, Ltd., and C. J. Smithells. Oct. 24 1944. 645,681, and 645,682.

Manufacture of gypsum cement and building, insulating and other materials prepared therefrom.—Manchester Oil Refinery, Ltd., and V. Weinberg. June 25 1945. 645,821.

Production of cleansing compositions in solid form.—J. Malecki. July 14 1947. 645,752.

Manufacture of cast iron.—British Cast Iron Research Association, and H. Morrogh. June 9 1947. 645,862.

Process for refining hydrocarbon oil.—Separator-Nobel A/B. Dec. 4 1946. 645.826.

Stabilisers for rubber and the like, and the preparation thereof.—Firestone Tyre & Rubber Co. Jan. 2 1947. 645,828.

Separation of niobium from tantalum.—Soc. Generale Metallurgique De Hoboken, and J. P. Leemans. Feb. 18 1947. 645,832.

Method for the production of a catalyst.—Sana. Narodni Podnik. March 18 1947. 645,872.

Electroplating of metallic wire.—Kenmore Metals Corporation. March 18 1947. 645,834.

Production of nitriles.—Socony-Vacuum Oil Co., Inc. July 25 1947. 645,754 and 645,755.

Colloidal solutions of inorganic oxides.—National Aluminate Corporation. July 29 1947. 645,703.

Construction of electric heating mantles. Isopad, Ltd., and H. Reik. Aug. 26 1948. 645,848.

Ignition device for oxygen piercing and cutting lances.—Soc. l'Air Liquide, Soc. Anon. Pour l'Etude et l'Exploitation des Procèdes G. Claude. Oct. 23 1947. 645,757.

Production of phosphatic fertilisers.—L. A. Johnson. Nov. 22 1948. 645,709.

Gas-liquid or liquid-liquid separators.—Hefa National Corporation, and J. Neumann. Dec. 8 1947. 645,710.

Production of elastomers of polyvinyl chloride.—Boothby & Thompson, Ltd., S. Szekely and C. A. Redfarn. Dec. 16 1948. 645,712.

Vitamin-containing products.—Nopco Chemical Co. Jan. 15 1948. 645,854.

Manufacture of pyrophorus and hydrogen-producing compositions.—T. Moklowski. Feb. 26 1949. 645,855.

Nucleon detectors.—J. Sharpe. Jan. 28 1949. 645,891.

Saponification of cellulose acetate textile materials.—British Celanese, Ltd. Feb. 24 1948. 645,761.

Gas-escape reaction propulsion devices.—I.C.I., Ltd., A. C. Hutchinson and M. Wilson. Jan. 28 1949. 645,897.

Thio-ether substituted thiazoles and selenazoles and process of preparing the same.—General Aniline & Film Corporation. March 22 1948. 645,901.

Method of separating esters of octahydrophenanthrene carboxylic acids.—Ciba, Ltd. March 31 1948. 645,765.

Method of rendering fabrics water-repellent.—J. G. Fife. (Dow Corning Corporation). May 11 1948. 645,768.

Moisture-proofing heat-sealing coating compositions, and articles coated therewith.—British Cellophane, Ltd. May 28 1948. 645,914.

Preparation of propylene-diamine.—Carbide & Carbon Chemicals Corporation. Oct. 5 1948. 645,786.

Filters for air and gases.—Air-Maze (Great Britain), Ltd., and T. C. Locker. Sept. 29 1949. 645,654.

Extraction and purification of organic compounds.—W. Ransom & Son, Ltd., and R. A. G. Stockdale. May 11 1948. 645,876.

Manufacture of thiourea.—Koppers Co., Inc. July 15 1947. 645,701.

Amended Specifications

Concentration of acids.—British Celanese, Ltd. 570,908.

Manufacture of chlorocresols.—Imperial Chemical Industries, Ltd., and another. 578,477.

Drying of filaments.—American Viscose Corporation. 584,070.

Method of, and apparatus for, cleaning, rust-proofing, priming and painting sheet metal articles such as vehicle bodies and chassis.—Pressed Steel Co., Ltd., and others. 584,432.

Manufacture of metallisable monoazo dyestuffs of the pryazolone series.—R. M. Hughes (J. R. Geigy Akt.-Ges.). 629,412

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

TECHNICAL RECORDS ASSISTANT MANAGER required by the Division of Atomic Energy (Production), Ministry of Supply factory, Capenhurst, Nr. Chester, to be responsible to the Technical Group Manager for the organisation and operation of the technical records and statistical department of a large chemical engineering factory.

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PATENTS & TRADE MARKS

KING'S PATENT AGENCY, LTD. (B. T. King A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone: City 6161.

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No. 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double " U " type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double " Z " mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

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The Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Training Chemical Engineers

THE Ministry of Labour report on the future supply and demand for chemical engineers (THE CHEMICAL *Age*, *63*, 633) suggests that any young man with a well defined bent for chemistry and machines can look forward to a lifetime of full and well rewarded employment if he can acquire the increasingly exacting training. Over the next five years, 1096 newly qualified chemical engineers will come from the universities, technical colleges, and the Institution of Chemical Engineers; but industry is expected to require in the same period 1310. That clearly does not overstate the prospects for the chemical engineer, for whom there would, it is certain, be many more openings if trained men were available. It is still not uncommon for chemical engineering posts to be held by chemists with some knowledge of engineering or by engineers with some knowledge of chemistry.

The committee has rightly insisted that chemical engineering is neither applied chemistry nor applied physics, and certainly not some arbitrary blend of chemistry and engineering. It is an applied science in its own right, with its own fundamental principles. Ideally it requires a four-year course after an intermediate science degree; at present, however, it is felt that an extension of the usual three-year course should not be urged. That recommendation calls to mind the fact that it is little more than a generation since a one-year special course after the acquisition of a degree in chemistry was considered a suitable university training in chemical engineering. The period from the intermediate stage was still three years, but the active study of engineering did not begin until the third year.

In view of the greater complexity and the high investment value of modern chemical engineering projects, it is not illogical to suggest that a substantial part of the young man's total education might take place in chemical industry itself, that the final stage should be "in-training." If industry expects too much from university education, broader aspects of that education will inevitably be sacrificed. A number of authoritative organisations have stressed the importance of general education, of well developed powers of expression, and of such subjects as economics, social science, and even law. The universities cannot meet all these requirements unless the period of education is considerably lengthened.

Industry has, however, shown great aptitude for turning chemists into improvised chemical engineers, and has set up some effective joint teams of chemists and engineers; it would not

inconvenient and illogical and the subsequent postulation of the tau-mesotron has further complicated the issue. The lesson pointed by this and similar readjustments is that when such particles are " labelled " usually much remains to be discovered about them and any naming that is done is likely to be tentative. This problem has its analogies in the ordinary troubles that beset chemists who are endeavouring to produce order out of chaos in the naming of elements, re-classification of units, and the standardisation of the *p*H scale.

Significance of Minute Errors

NUCLEAR study has been obliged to invert the normal process of examining experimental data of palpable and reproducible values and producing a law. Those seeking to know more about the inwardness of the atom are liable to find in minute experimental errors, which other branches of science might safely disregard, the evidence on which they can postulate the existence of elusive new entities. If, as is likely, they have a life only to be measured in millionths of a second and a mass which physical sciences, the nuclear scientist may fairly be exonerated if he fails to place them firmly in any familiar perspective. The troubles of the nuclear scientist are manifestly his own business, but they do appear to deserve a moment's sympathy from those who deplore his inability to call a spade a spade—without a Greek qualification.

France's Chemical Engineers

THE number of chemical engineers a country needs is coming to be recognised as the modern indication of its industrial progressiveness. France's recovery from the injuries of war is reflected by the existence there of an unsatisfied need for chemical engineers which sounds to be as urgent as our own. The evidence of that was given in London this week by the distinguished head of the Ecole Nationale Supérieur de Strasbourg, Professor H. Forestier. Strasbourg and Paris are the two main centres in France of practical training in chemical engineering, and share with Nancy, which is the source of most of the theoretical work, almost exactly the sort of problems facing the Institution of Chemical Engineers and the universities and technological institutes here. Professor Forestier, guest on this occasion of the Institut Français, made it clear that France finds just as refractory as our own the problems of relating chemical engineering to immediate needs without sacrificing inventiveness, and of procuring willing workers of the right calibre. Candidates with higher mathematics, some physics and chemistry are not rarities in either country, but, as the president of the Chemical Engineers (Professor D. M. Newitt) observed, those attainments do not make a man a chemical engineer or even indicate that he has the flair to become an effective one.

Sitting Down

WORK has its fascination . . . especially for spectators. Contemplation of others hard at their daily tasks is for some a pleasurable and satisfying pursuit. The multitudes which gather round the hole in the road watching the man with the drill have borne witness to this since the days of Macadam. But, like so many of our rapidly diminishing pleasures, the philosophical approach to effort may soon be denied us. A cloud looms over the throng of innocents near the " Road Up " sign. For there is a suggestion that it is possible—perhaps necessary—that laboratory personnel should no longer stand as they labour. In his preface to a recent book on microanalysis an eminent professor suggested that " it is a very great advantage to have a laboratory specially adapted . . . by the provision of benches . . . at which the analyst can work comfortably *while sitting* " Such dangerous dogma, if allowed to spread, might in time reach the ears of those sturdy excavators of pipes and drains. One can well imagine the result. Sitting down on the job—and no fun for the passer-by.

DISTRIBUTION OF CHEMICAL ENGINEERS

Deficiency Will Not be Less than 15 per cent

THE nearest approach yet made to a concise statement of the prospective need of industries for qualified chemical engineers forms the most useful contribution of the Chemical Engineers' Sub-Committee of the Technical Personnel Committee of the Ministry of Labour. The main conclusions, particularly that the number trained between now and 1954 would be approximately 1096 and the recruitment required for industries would be not less than 1310, have already been summarised (THE CHEMICAL AGE, *63*, 683).

In its study of the main sources of newly qualified engineers and of the evidence obtained from a number of industries of their probable requirements, the sub-committee acknowledges the likelihood that the latter figure is an under estimate and admits that the field considered does not necessarily cover all the departments in which chemical engineers may be needed.

REQUIREMENTS OF INDUSTRIES

	Number employed in 1938	Number employed in 1949	Number estimated to be employed by 1954	Average annual rate expansion 1938-1949	1949-1954
Chemical plant manufacturers	60	239	348	13%	8%
Chemical industry	286	864	1,463	11%	11%
Manufacturers of gas appliances	41	78	125	6%	10%
Gas supply undertakings	58	87	105	4%	4%
Oil industry	—	99	268	—	22%
Coal industry	—	179	196	—	2%
Govt depts	9	47	76	16%	10%
	454	1,593	2,581	*10%	*10%

* Excluding oil and coal industries.

In the largest single group, the chemical industry—says this section of the report—the number which it is hoped to employ in 1954 represents an increase of very nearly 70 per cent over the 1949 figures. The increase for the sum of the industries concerned is 62 per cent. The 1954 figures will include, of course, as well as expansion properly so called (the emergence of new posts), some vacancies for chemical engineers which are outstanding at the present time, and also appointments which in the past have been held by mechanical engineers or chemists, and which it is policy to fill with chemical engineers as they become vacant.

The average annual rates of expansion have been shown on a basis of compound interest in order to compare the trends over the periods 1938-1949, and 1949-1954. In the industry employing the greatest number of chemical engineers, the chemical industry, there is no difference between the two average annual rates for 1939-1949 and 1949-1954. This also applies to the total figures for all the industrial groups (with the exception of the oil and coal industries for which figures relating to the earlier period are not available).

The total expansion of 988 indicated by the table does not represent the whole of the probable demand in the industries for newly qualifying chemical engineers, because it includes no allowance for replacement of wastage. If we assume, as in the Barlow Report on scientific manpower, that the average professional life of a scientist is 30 years (some members of the sub-committee considered this a considerable overestimate of the average " professional life ") one sixth of the number employed in 1949 can be expected to have " wasted " by 1954. This increases the total of estimated openings in the period for new men by a further 265.

Teaching Demands

After allowing for wastage on this basis, and including additional posts in universities and colleges which the anticipated expansion will necessitate, the total estimated demand for chemical engineers for the coming five years as indicated by the information at the disposal of the sub-committee may be summarised as follows:

Chemical plant industry ...	150
Chemical industry	740
Coal	45
Gas	95
Steel	20
Oil	190
Government departments ...	40
Teaching at universities and technical colleges	30
Total	1,310

It is seen from the tables that in round figures the estimated supply of professionally qualified chemical engineers amounts at most to 85 per cent of the demand, and that the estimated deficiency is of the order of 200 in the five-years period. This conclusion is in line with experience throughout the post-war years,

during which there has been a steady excess of demand over supply, with no indication that the gap is decreasing.

The supply and demand figures suggest that there is every prospect of the shortage of chemical engineers continuing after the end of the period under review. After careful consideration, however, and especially in view of the outside economic factors that may affect the demand, we do not feel that we would be justified in drawing conclusions about the period following on 1954, or in making recommendations based on the long range extrapolation of present trends.

Nevertheless, it is evident that if the industrial productivity of this country is to be expanded to its maximum extent, the increasing demand for chemical engineers which is already manifest must be satisfied. There would seem, on the facts so far set out in this report, to be a clear need for a greater output from the universities and technical colleges.

Parliamentary Topics

THE Government's intention to import from Continental sources the quantity of superphosphate fertilisers necessary to make good the deficiency in production here was announced by Mr. G. Bottomley, secretary for overseas trade, in reply to Mr. G. Jeger. Contracts to that end had already been placed.

PARTICIPATION of private firms in the development of atomic energy was the subject of questions by Mr. F. J. Erroll to the Minister of Supply in the House of Commons on Tuesday. The Minister of Supply (Mr. G. R. Strauss) said that although large-scale co-operation was not yet possible, industrial firms were helping in preliminary studies of the feasibility and design of power reactors. The Ministry was in close touch with industry, and every encouragement was being given to the development of industrial applications of radioactive isotopes.

THE whereabouts of Dr. Bruno Pontecorvo was again the subject of a number of Parliamentary questions. No conclusive evidence was obtainable, stated the Minister of Supply, but he had no doubt that Dr. Pontecorvo was in Russia. So far as was known, Dr. Pontecorvo took no documents abroad with him.

DEVELOPMENT of the lead deposits in Lanarkshire was referred to by Lord Dunglass, who asked the Minister of Supply if he would have a survey carried out. Mr. Niall Macpherson stated that he had inquired about these deposits, which extended into Dumfriesshire five years ago. Mr. G. R. Strauss replied that the chief responsibility for producing lead rested with private companies. Lord Dunglass asked the Minister if he was not aware that, owing to present restrictions on development rights, there was little incentive for private companies.

THE purchase of zinc from the Continent at a figure higher than the selling price in this country was the subject of a question by Mr. J. Grimston, who also asked about the allocation of the metal to Royal Ordnance factories. To disclose the price paid was contrary to established practice, answered Mr. G. R. Strauss. The Ordnance factories' demands for defence work would be met in full; for civilian work, allocation would be restricted to 90 per cent of the 1949 intake, the same as commercial manufacturers received.

FORTY-ONE tons of zinc were used by the Royal Mint in the first nine months of this year compared with 150 tons in the 12 months of 1949, stated Mr. Hugh Gaitskell, Chancellor of the Exchequer, in a written answer last week. The present allocation is 11 tons a month.

EXPORTS of copper and copper scrap were prohibited except under licence stated the Minister of Supply. Small quantities of unwrought copper might be exported under licence, but copper alloys in ingot form were restricted to a quota based on 1949 exports. Since September, semi-manufactures of copper had been prohibited except under licence.

GASIFICATION of coal at Newman Spinney was again the subject of questions. The Minister of Fuel and Power (Mr. Philip Noel-Baker) reiterated a statement made earlier that the project had begun well and added that results of the experiment would be assessed at the end of the year when plans for the future would be made.

Import Concessions Extended

The Board of Trade states that from November 1 Britain's "liberalisation" import concessions will be extended to Switzerland and Liechtenstein. The concessions permit the import without individual licence of a wide range of goods from OEEC and many other soft-currency countries. This decision follows Switzerland's decision to accede to the European Payments Union.

COMMONWEALTH SURVEY OF FERTILISERS

Supplies, Consumption and Prospects

CERTAIN broad conclusions may fairly be drawn about the future of fertiliser supplies. Taking the world as a whole, reserves of nitrogen in the atmosphere and of phosphate and potash in the earth are adequate to meet all possible increases in demand, but, should consumption rise much more rapidly than at present estimated, the expansion of extraction and processing facilities might be temporarily overtaken. This is stated in "A Survey of the Trade in Fertilisers" (HMSO, 8s. 6d.), which constitutes the 34th report of the Commonwealth Economic Committee.

Consumption has increased and potential demand may rise further, particularly in underdeveloped countries where measures are being undertaken or are in prospect to make good some of the deficiencies in plant foods. Even in those countries in which fertiliser consumption is heavy it is recognised that increased agricultural production would result from heavier or more effective applications. Nevertheless, the price factor cannot be ignored; in a number of European countries, even in 1948-49, farmers in some cases seem to have regarded agricultural prices as an indication that further expenditure on expansion of output would not be sufficiently remunerative.

Ample Nitrogen and Phosphate

The adequacy of plant food reserves, however, is not the whole picture; short term local deficiencies of particular varieties of fertiliser may occur and there is a shortage of sulphur, which is needed in the preparation of the two most widely used chemical fertilisers, ammonium sulphate and superphosphate. With upwards of three quarters of the world's total supply of chemical nitrogen fixed from the atmosphere, the basic raw material is virtually unlimited and, given adequate fuel or hydro-electric power, any future increase in demand could be met by expansion of productive capacity. Known reserves of phosphate rock are so great that there can be no reasonable expectation, whatever the trend of consumption, of their being exhausted before further beds are discovered and brought into production.

Prospective supplies of potash appear to be ample to meet all predictable requirements. In Europe, the output of Spain, France and Germany appears capable of considerable further expansion and progress is being made in the concentration of potash salts. It is too early yet to say whether the exploratory work in the U.K. and Canada or the recently reported discovery of extensive potash beds in Poland will lead to large-scale production.

Sulphur Prospects

Of the sulphur problem the report observes that not only has world demand for sulphuric acid for all purposes increased very heavily since before the war but (owing largely to the smaller capital requirements and, often, lower running costs of acid plants based on brimstone as compared with those based on pyrites) the proportion of sulphuric acid made from elemental sulphur has also risen considerably. Adequate supplies of raw sulphur for the operation of additional sulphur-burning plant will not necessarily be available to importing countries and enhanced importance will therefore attach to indigenous supplies of sulphur-bearing minerals (pyrites, galena, zincblende, gypsum, etc.), to the cleaning of smelter and other industrial gases and to methods of concentrating the P_2O_5 content of phosphate rock, or making available a greater proportion of the existing P_2O_5 fraction, without the use of sulphuric acid; moreover, phosphate is also applied as one of the N-P types of fertiliser in the manufacture of which no sulphur derivatives have been employed.

World consumption of phosphate increased from 1946-47 to 1948-49 as greater supplies of rock became available from North Africa and the Pacific Islands for the manufacture of superphosphate and, in Europe, as war damage was made good in the industry. With the recovery of steel production, more slag and other kinds of phosphate fertilisers became available over this period, but in 1948-49 they contributed only some 20 per cent of the estimated world consumption of P_2O_5. The Commonwealth uses about 20 per cent of the world total, a higher proportion than in the case of nitrogen or potash. The most striking change since before the war has been the rise in the U.S. consumption from less than one-

fifth to more than one-third of the world total.

Total trade in phosphate, which (in terms of P_2O_5) had fallen by about one quarter during the war, rose rapidly from 1946 to 1948 to reach 18 per cent, and the following year 29 per cent, above the pre-war level. In 1949 the Commonwealth accounted for 36 per cent of total imports, a higher proportion than before the war, but only 16 per cent of total exports as against 20 per cent in 1938.

Heavy Demand

Estimated world potash consumption jumped in one year from seven to 24 per cent above pre-war; during the following year, 1948-49, there was a further increase to 40 per cent. Europe, the largest producer of potash, is also the largest consumer, taking two-thirds of the world supply in 1948-49; the U.S.A., with nearly 30 per cent, absorbed most of the remainder, consuming nearly all her own production. Use in other parts of the world is low. It is clear that the total potash trade recovered, rapidly after the heavy wartime reduction, and by 1948 was probably not far off the pre-war level, while there was a very substantial advance of perhaps 30 per cent in 1949. Total trade in nitrogen recovered fairly rapidly from the wartime reduction and reached by 1949 some 25 per cent more than in 1938.

The rise in fertiliser prices since the war, while substantial in itself, was considerably less than that of farm products generally. Full data are not available for many countries. but the fertiliser price indices of the U.K., Canada, and the U.S.A. showed increases of 35-50 per cent as compared with 120-200 per cent for farm products. In Denmark, where the wartime interruption of imports had caused an acute shortage of fertilisers, there was an increase of 90 per cent in fertiliser prices and of only 115 per cent for farm products.

Dealing with the net fertiliser trade position of the Commonwealth countries, the report draws attention to the fact that broadly speaking the Commonwealth as a whole is a net exporter of nitrogen, but an importer of phosphate and potash. In 1948-49 only two countries, the U.K. and Canada, exported nitrogen in significant quantities; India was the largest importer, followed by the Colonial Empire. The total value of fertiliser imports in 1948 into Commonwealth countries other than the Colonial Empire was £26.8 million, and of exports £17.9 million.

PRODUCTION ESTIMATES
(World totals in all cases exclude the U.S.S.R.)

NITROGEN
(thousand tons N)

Region	1938-39	1946-47	1947-48	1948-49
Europe	1,630	1,056	1,305	1,517
North and Central America	285	837	1,050	1,133
South America ...	240	277	289	294
Asia	367	169	220	304
Oceania	5	5	7	11
World total ...	2,528	2,344	2,872	3,259
of which Commonwealth	181	409	426	472

MANUFACTURED PHOSPHATE
(thousand tons P_2O_5)

Region	1938	1946-47	1947-48	1948-49
Europe	2,126	1,577	1,969	2,334
North and Central America	639	1,722	1,950	1,957
South America ...	32	43	43	41
Asia	305	74	146	174
Africa	44	82	88	107
Oceania	351	357	386	436
World total ...	3,498	3,855	4,582	5,049
of which Commonwealth	508	795	866	935

POTASH
(thousand tons K_2O)

Region	1938	1946-47	1947-48	1948-49
Europe	2,429	1,487	1,865	2,243
North and Central America ...	283	800	852	950
South America ..	10	10	10	5
Asia, Africa and Oceania	33	42	32	1
World total ...	2,755	2,339	2,759	3,199
of which Commonwealth	—	2	1	1

ESTIMATED U.K. FUTURE CONSUMPTION
(thousand tons)

	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56
N	200	200	210	220	230	240
P_2O_5	450	450	460	470	480	490
K_2O	200	200	205	210	215	220

ESTIMATED CONSUMPTION
(thousand tons plant food)

Region	1936-38 Average			1946-47			1947-48			1948-49		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Europe	1,277	2,011	1,742	1,189	1,594	1,530	1,437	1,980	1,895	1,470	2,239	1,991
North and Central America	374	703	410	741	1,647	826	832	1,760	877	956	1,863	987
South America ...	31	22	10	46	73	14	47	77	17	53	71	28
Asia	463	297	116	325	130	66	475	176	23	489	237	189
Africa	86	74	11	50	88	23	69	96	26	91	111	31
Oceania	17	345	15	11	357	9	14	386	10	15	452	8
World total	2,248	3,452	2,304	2,362	3,889	2,408	2,874	4,475	2,848	3,074	4,973	3,229
of which Commonwealth	112	580	124	250	800	189	294	885	259	323	999	277

ROAD HAULAGE RATES

Chemical Manufacturers Discuss Increases

HAULAGE rates increases have been discussed at a meeting of representatives of the Road Haulage Executive and certain chemical manufacturers in Widnes. The latter were told that they would be invited to negotiate rates only for certain named chemical manufacturers, while other firms would be excluded from the result of such negotiation.

Mr. E. N. Wainwright stated at the meeting of the Transport Committee of Liverpool Chamber of Commerce that he was concerned to hear that Widnes manufacturers might be agreeing to rate increases and he inquired whether British Road Services could justify an application for higher rates. He hoped that any firm would refuse to agree to any increase in rates unless sufficient evidence was produced to justify it.

Mr. Palim, district manager of the Road Haulage Executive (N.W. Division), said British Road Services were convinced that an examination of all those rates which they had taken over from the private companies must take place. If it was found that any rate could not be operated economically, then it became essential for the executive to discuss an increase in those rates with the individual traders.

Mr. Wainwright replied that it was understood that the British Transport Commission would go before the Transport Tribunal, possibly in two years' time, with a demand for an up-grading of road haulage rates. If traders had already accepted an increase in rates it would undermine the opposition to the Transport Commission's demand.

It seemed an attempt was being made to subsidise British Railways and it did not appear traders were now receiving a service which could be compared with that given by private enterprise prior to nationalisation.

Train Fire: Cellulose Paint is Exonerated

PAINT containing cellulose nitrate used in the coaches was not considered to be the cause of the train fire at Beattock on June 8. This was stated by the Parliamentary Secretary of the Ministry of Transport (Lord Lucas of Chilworth) in reply to questions in the House of Lords last week.

The paint was of a different kind from that associated with the Penmanshiel fire, and it was not thought it had contributed to the loss of life, although it might possibly have had some slight effect on the subsequent conflagration.

The investigating officer of railways had now completed his inquiries. One difficulty had been that no witness had survived, and the two coaches concerned were so completely gutted that little evidence remained to show how the fire started.

There was little doubt, however, that the fire was caused by a cigarette or carelessly discarded match in a compartment, which was afterwards unoccupied. The cause of death was the sudden inrush of a wave of intense heat into the compartment occupied by the victims.

It was hoped that the investigating officer's report would be published before the end of the year. The Government was taking all steps to see that its recommendations were implemented to prevent future occurrences.

Fatal Explosion

AN explosion on Monday in one of the mixing houses for mining explosives of Explosives and Chemical Products, Ltd., at Bramble Island, near Harwich, resulted in the death of three men working in the 50 ft. building, which was entirely demolished, and the disappearance of another male worker. Twenty-five men, women and girls were reported to have been injured. The blast is stated to have smashed windows 12 miles away.

Work has been suspended and the company is to hold an inquiry.

Importance of Scientific Films

THE production of films illustrating the contributions of science to human wellbeing, through medicine, agriculture and nuclear physics, was urged at the recent fourth annual congress, in Florence, of the International Scientific Film Association. Great Britain was represented by 10 delegates, including representatives of the Scientific Film Association of Great Britain, the British Council and the Royal Photographic Society, and contributed about 30 per cent of the total of 120 films screened.

RESEARCH CENTRE CLOSED

Sudden Decision by Powell Duffryn

THE abrupt closing of the Powell Duffryn research laboratories in Battersea Park Road, London, S.W., was the subject of action on Monday by the Association of Scientific Workers. It asked that a deputation should be received by the company, following the receipt during the week-end by some 50 scientific and technical workers and about 100 other employees of registered letters informing them that they were "denied access."

Sir Herbert Merrett, the newly elected chairman of Powell Duffryn, Ltd., in a statement to the Press, said: "In view of the fact that the Hayes factory of the company's wholly-owned subsidiary Powell Duffryn Carbon Products, Ltd., is now in active commercial production, the board of Powell Duffryn has decided in the interests of greater efficiency that the time has come when all necessary research and development work to support the expansion of the important carbon business should be transferred from the Battersea laboratories and consolidated at Hayes.

"In order to ensure that this reorganisation took the most appropriate form, the board decided to set up a reorganisation committee to make immediate recommendations for the future distribution of the work. In order to facilitate the work of this committee, it was decided that the Battersea laboratories' staff should be given temporary leave of absence on full pay."

More Fatal Accidents

DEATHS from industrial accidents in the United Kingdom in September were nearly two-thirds as large as in August. The total was 232, compared with revised figures of 140 for the previous month and 107 for September, 1949. (*Ministry of Labour Gazette,* Vol. 58, No. 10).

Only six fatal accidents were associated with the chemicals, oils, soap and allied industries. Metal conversion and founding accounted for nine, metal extracting and refining, two, and other metal trades, one. There were two deaths in the clay, stone, cement, pottery and glass group, and two in gas works.

No deaths were recorded in the U.K. in September under the Factories Act, 1937, or under the Lead Paint (Protection against Poisoning) Act, 1926.

U.S. TO CONTROL SULPHUR

Statutory Restriction of Exports?

ALTHOUGH U.S. sulphur production for 1950 is expected to reach a peak level of 5.2 million tons, 1951 will see the imposition of export controls on the element, according to Washington officials —states our New York correspondent. After this year, it is pointed out, the nation's raw sulphur deposits will gradually decline and production in 1951 is not expected to exceed 4.9 million tons.

In view of the possibility that export controls will operate during the first quarter of 1951, ECA officials are encouraging foreign countries to start purchasing pyrites from European sources to reduce their dependence on U.S. elemental sulphur. It is recognised that European countries are reluctant to make the change from U.S. elemental sulphur to the more expensive pyrites; Europe's facilities are set up to use sulphur rather than pyrites and it will take time and money to convert them.

It seems likely, however, that European consumers will have no choice but to switch to pyrites.

Controls are also considered necessary to keep domestic sulphur available for American defence needs. Efforts will also be made to develop U.S. domestic pyrites and recover sulphur from gases and ores.

748 More Pharmacists

THE number of pharmaceutical research scholarships may, before long, be substantially increased, Mr. C. W. Maplethorpe, chairman of the Pharmaceutical Society's education committee, stated in the course of an address on the society's education policy. There are already three such scholarships of the annual value of £300 each.

A lease of a building has been taken for the establishment of a well-equipped laboratory for work in connection with the society's scientific publications.

Because of the new opportunities in pharmacy, said the chairman of the education committee, more young people were entering the profession. Since January they numbered 748, and, if the entries during the remainder of the year were at the same rate as last year, they would exceed the entry figures for any year since 1933. Thirty-five women and 90 men qualified at the society's September examinations.

FIRE HAZARDS IN PLASTICS INDUSTRY

*Dust Explosion the Greatest Risk**

PLASTICS, except nitrocellulose, have a low order of combustibility and none of them presents any greater fire hazard than wood, paper or other ordinary combustible material—many of them much less than wood—and some have, in fact, flame-proofing qualities. However, being organic substances, all synthetic resins and plastics, given favourable conditions, will burn.

Their burning characteristics, as of any other combustible material, depend on the physical form of the material. Finely divided material burns rapidly. When plastics are in the form of dust in suspension in air there is always the possibility of a dust explosion—just as there is with the dusts of starch, sugar, grain, coal, etc.

All sources of information seem to agree that the dust explosion hazard is greater than the fire hazard. The few incidents recorded within the plastics industry of which details have been made available have generally occurred as the result of the ignition of dust. This hazard exists principally in the premises of the manufacturer of synthetic resins and moulding compounds (mostly the larger organisations) and to a less extent in the premises of plastics moulders and fabricators.

Few synthetic resins in their pure state possess all the desired physical properties.

Fillers and Flammability

By varying the amounts and combinations of other ingredients—fillers, pigments, plasticisers, lubricants and solvents—the manufacturer may modify the properties of a plastic, including, to some extent, its combustion characteristics. For example, certain fillers, consisting of mineral substances such as asbestos, mica and diatomaceous earth, would definitely reduce the flammability. Some plasticisers may increase flammability slightly, while others, such as certain phosphates will definitely act as fire retardants.

Thus, by far the greater potential hazards of the plastics industry are in the primary manufacture and are centred around the handling of combustible dusts and flammable liquids.

The possibility of generating of explosive dusts is inherent in the crushing, grinding and pulverising in the progressive size-reduction of the original synthesised resin and in the subsequent compounding with fillers and pigments. As in many other industries involving organic dusts, this dust hazard can be controlled by the adoption of safe practices and operating conditions. These include:

1. The provision and maintenance of completely dust-tight equipment.
2. Adequate dust collecting systems.
3. Conformity with the recognised standards for electrical equipment and systems in hazardous locations.
4. Magnetic separators for removal of tramp iron.
5. Proper grounding arrangements to prevent the accumulation of static electricity.
6. Inert gas protection in all grinding equipment and conveyor systems.
7. Explosion reliefs to prevent extensive damage to equipment and building.
8. Automatic sprinkler protection.

Most of these preventative and precautionary measures apply also to the flammable liquid hazards.

With the passing of the plastic moulding powders and sheeting, rod, tubes, etc., to the fabricators, the fire hazards very definitely decrease in severity.

* An abstract of a paper read at the Fire Protection Conference held at the 79th annual general meeting in Toronto of the Canadian Manufacturers' Association, Inc.

Principles of Dust Collection

THE fundamental mechanism of filters and spray de-dusters was discussed by Mr. C. J. Stairmand in a paper on "Dust Collection by Impingement and Diffusion," given at the recent inaugural meeting, at Birmingham University, of the Midlands branch of the Institution of Chemical Engineers.

The mechanism of impingement filtration intended to measure a dust-laden air stream flowing round an obstacle was stated to be a function of the non-dimensional group $\frac{Dg}{Vf}$. The application of the Vg/Df concept—

where D = Diameter of obstacle, g = Gravitational constant, V = Velocity of approach, f = Free falling speed of the particle — in any self-consistent system of units

—was applied to spray tower performance. It was shown that the maximum efficiency for the smaller dust particles occurs for droplet sizes of about 800 microns and that, except for the very finest dust particles, the efficiency varies little over the range of drop sizes 500-1000 microns.

PHOTOGRAPHY OF ATOMIC PARTICLES

Development of Highly Sensitive Materials

From A CORRESPONDENT

FORTY years ago, scientists succeeded for the first time in photographing the tracks of alpha particles on photographic plates. The plates then in use, however, were relatively inefficient and for many years the photographic method was not regarded as very reliable and was restricted to a limited range of investigations. The development of nuclear track emulsions has now overcome these limitations, and has made photography one of the most valuable methods of detection employed in nuclear physics. Photographic materials are now capable of recording the path of charged particles of any energy.

The potentialities of autoradiography, too, have been enormously increased since the war by the introduction of radioisotopes and an emulsion with a very high resolving power, allowing high magnification.

First Developments

The first considerable advance in the photographic recording of particle tracks was a plate produced by Ilford, Ltd., at the suggestion of Professor Powell, of Bristol University, who has been closely identified with the application of the photographic method to nuclear research. This plate had five grains, a high concentration of silver, and was thickly coated with a very small proportion of fog grains (or grain spontaneously developable). It clearly indicated the physical properties necessary, but some of the interesting particles could not be recorded because the grains were not sensitive enough. The Kodak laboratories were responsible for developing the still more sensitive emulsions subsequently produced in Britain.

Three types of nuclear track plates are now supplied by Kodak, Ltd. The first is known as NT-1a, and is intended primarily for the recording of alpha and other particles of high ionising power when particles of lower ionising power, such as protons, or electrons released by gamma rays, would give an obtrusive background if emulsions of higher senstivity were used. Tracks of alpha particles in these emulsions can be easily distinguished from those of protons.

The second type, NT-2a, is of higher sensitivity and is intended for the recording of particles of medium ionising power, such as high-energy alpha particles, protons and deuterons of moderately high energy.

When first developed the emulsion was tested for proton sensitivity by bombardment with neutrons from a radium-beryllium source. A 17 cm. thickness of lead was interposed between the plates and the source to diminish the gamma-ray intensity incident on the sensitive material.

Microscopical examination of the plates after processing showed that the background to the proton tracks was of a much more heterogeneous nature than that obtained by exposure to a pure alpha-ray emitter, such as polonium. Under high magnification, this heterogeneous background was found to consist of numerous fairly short, highly curved chains of developed grains. These were believed to be the low energy ends of tracks caused by photo-electrons and recoil electrons liberated by gamma-rays. Further investigation showed that the NT-2a was the first emulsion on which electron tracks could be recognised with certainty.

The NT-2a plate was introduced in 1948 and has recently been improved in two respects. Latent image stability has been considerably enhanced, and the grain diameter is now of the order of 0.2-0.3 microns. Scanning and grain counting are easier.

Deficiencies of NT-2a Plates

The NT-2a plates were, however, only sensitive enough to record the tracks of electrons with energies of up to 80 keV., the residual path-length in the emulsion of an electron of 80 keV. being about 30μ. A singly charged particle, with a velocity of the order of 90 per cent that of light, has the lowest ionising power possible. The energy of an electron with this minimum ionising power is between 500 and 1000 keV., and its residual path-length in the emulsion will be between 800 and 2000, assuming that the emulsion has a stopping power of 2000 to the electrons. Because the ionising power of an 80 keV electron is approximately three times the minimum, an emulsion with a triple increase in sensitivity over that of NT-2a was required to record tracks of particles of minimum ionising power with any certainty.

This increase of sensitivity was achieved

Much of the information in this article was obtained in the course of a visit to the research laboratories of Kodak, Ltd.

in a new plate known as NT-4, which spontaneously records the tracks of cosmic ray particles. It has to be used very soon after manufacture, because tracks tend to accumulate in the plates from cosmic radiation and also from the natural radioactive contamination of the atmosphere.

The NT-4 emulsion was the first to compete in sensitivity with the Wilson cloud-chamber and its introduction has already resulted in the observation of new phenomena in cosmic ray investigations, where the highly energised particles involved have too low an ionising power to be recorded on slower plates. It has enabled the decay of μ-mesons to be seen for the first time and its use has provided more evidence for particles of mass 1000me. It has also been responsible for the observation of new phenomena such as the production of showers of penetrating particles in cosmic ray stars.

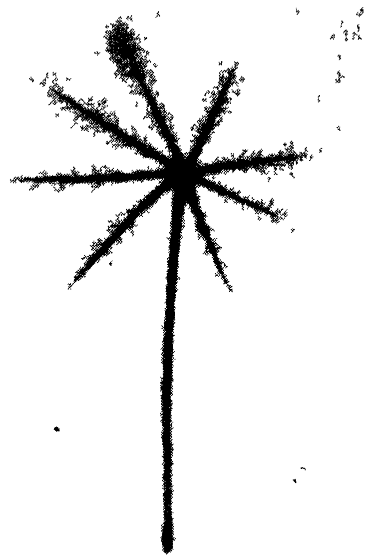
High energy protons have been known previously to disappear and at the same time to produce an electron and a positron. These pairs have been clearly observed in NT-4 plates exposed to high-energy protons. Photographs have also been taken of two colliding particles and the release of electrons during the process of radioactive decay. This is difficult to observe in a Wilson cloud-chamber but the photographic plate records the complete sequence of emissions of particles during the time of exposure.

Nuclear track plates are supplied to large research institutes, hospitals, etc., both in Britain and other countries. They are being used for a variety of industrial purposes, besides contributing in many directions to greater understanding of the composition of matter. It is also possible that investigation of the way in which they work may help to make clear the mechanism of photography, particularly in regard to the formation of the latent image.

Autoradiography

The potential uses of emulsions similar to those used in nuclear track plates in biology and medicine have not yet been fully realised. These emulsions afford, for example, a valuable means of tracing the paths of radioactive isotopes by the method known as autoradiography.

It is now possible for a doctor to know the destinations in the body of his patient of particular elements incorporated in a drug. Injected iodine goes to the thyroid. This can be confirmed by injecting an animal, such as a rat, with radioactive iodine. A microscopic section of the rat's thyroid is then placed on a glass slide in intimate contact with an autoradiographic plate. The areas of isotope deposition are indicated by the blackening of the film, enabling the distribution of iodine in the specimen to be clearly seen.



Autoradiography of lupin leaf showing distribution of radioactive phosphorus

This technique can be used to study the path of any element in animals, plants or metal alloys. A simple example is provided by an experiment on a lupin leaf. The stem of this leaf was placed for a few hours in a weak aqueous solution of radioactive phosphorus. The plant was then brought into contact with a fast X-ray film for a one-day exposure. The radioactive phosporus decayed with the emission of high-speed electrons, and caused ionisation of some of the silver halide grains of the emulsion. After processing, the autoradiograph revealed the distribution of the radioactive phosphorus within the stem and leaf, showing that the phosphorus was concentrated into the stem and veins.

Nuclear track emulsions are characterised by minuteness, high intrinsic sensitivity and close packing of the grains. They are very suitable for the autoradiography of microsections, because they provide high resolution combined with high sensitivity to charged atomic particles. Because of the divergence of charged particles from the point of origin in the specimen, good resolution can only be obtained if the emulsion layer is very thin. Au autoradiographic stripping plate has been developed

which allows a useful magnification up to 1000 times of the image produced. A characteristic is the reinforcement of the emulsion by a gelatin layer 10 microns thick. The emulsion is stripped from the plate and placed in contact with the specimen without the interposition of any support, and is processed through the gelatin layer.

Up to now the resolution obtainable in autoradiographs has been estimated by the sharpness obtainable when photographic emulsions are exposed in contact with radioactive isotopes deposited by biochemical processes. The distribution of the radioactive isitope, however, will vary from one specimen to another and even successive sections from the same specimen will not be absolutely identical. Hence a strict comparison of the resolution given by different techniques or photographic emulsions is most difficult. The following method of test is more promising.

A photographic silver image on a very fine grain material can be converted successively to silver bromide and silver iodide and still give a line separation of 0.5μ. These reactions can therefore be used to give a deposit of an iodine isotope with any required distribution, thus forming a radioactive test chart.

Such charts are made by applying about 0.01 c.c. of a solution of I^{131}, to an area 2 mm. × 2 mm. of the emulsion surface containing a test image previously converted to silver bromide. After washing and drying, a $4\text{-}\mu$ thick coating of the emulsion to be tested is transferred to the surface of the test chart. After the "exposure," the emulsion-coated test chart is soaked in water for a few minutes and the emulsion layer processed in the stripped condition.

In one example studied, the original test chart image represented line separations respectively of 4.5μ, 3.7μ, 3.0μ, 2.0μ and 1.7μ. It was apparent that in the original autoradiograph useful resolution was obtained with 2.5μ and possibly with 2.0μ separation, but not with 1.7μ.

It is considered that these test charts could be used for systematic estimation of the relative importance of the various emulsions and geometrical factors influencing the resolution of autoradiographs. They might also be used for comparing the effects of electrons of varying energy given by different isotopes. Another possibility is the production of test charts made from micro-photographic replicas of tissue sections to help in the preparation of autoradiographs made from biological material.

Growth of "Nucleonics"

EIGHTY-FOUR American manufacturers are producing 180 different kinds of instruments to detect radiation, according to a catalogue issued by the United States Atomic Energy Commission. These are serving to protect the health and safety of workers in atomic energy plants, for nuclear research, for finding and testing radioactive ores, and for all types of experiments involving radio-isotopes.

The total reflects a constant growth in the past five years. In 1947, there were only nine companies, producing 19 different kinds of instruments. By 1948 there were 67 companies producing 102 instruments.

This growth has been encouraged by the Commission, which has sponsored under contract the industrial engineering of numerous types of detection instruments developed in Government laboratories during and since the war. Recently, a number of new types of instruments developed independently have come on the market. The Commission's new catalogue lists 32 instruments capable of measuring and distinguishing between alpha, beta and gamma radiation. In last year's catalogue only 13 instruments were listed.

First Training Reactor

THE first nuclear reactor in the United States not owned and operated by the Atomic Energy Commission will be built at the North Carolina State College at Raleigh, using fuel loaned by the AEC to provide facilities for nuclear engineering research and education. It will be a low-power reactor (maximum 10 kilowatts) using enriched fuel containing not more than 1 kg. of fissionable uranium 235.

The reactor will be a "water boiler" type, similar to that at the Los Alamos Scientific Laboratory, in which the fuel is a solution of uranium salt in water.

The use of the reactor will be determined by the college itself. Plutonium produced will total less than a gram a year. Some 60 undergraduate and graduate students in nuclear engineering are enrolled at the college. Efforts will be made to develop practical means of using the heat incidentally generated.

Oil Vapour Fire

Flames from oil vapour which ignited in the laboratory at the Middlesbrough works of Sadler & Co., Ltd., last week, were extinguished before serious damage was caused.

SUPERCONDUCTIVITY AND NUCLEAR MASS

Direct Relationship Established in U.S. Laboratories

RECENT low-temperature experiments at the U.S. Bureau of Standards have resulted in the discovery of a new and unexpected relationship between superconductivity and the constitution of the atomic nucleus. Notes on these experiments in the *Journal of the Franklin Institute* (250, 4, 358) indicate that the atomic nucleus must exert an important effect upon the superconducting properties of the material.

It was found that the pure mercury isotope 198 becomes superconducting at a temperature about 0.02° K higher than does natural mercury—which is largely a mixture of five different isotopes having an average atomic weight of 200.6. This shift is proportionately quite large for a temperature so near to absolute zero and, because the difference between the isotopes depends only on their nuclear masses, the results indicated a direct relation between nuclear mass and superconductivity.

Explanation Sought

Hitherto it has been generally supposed that superconduct vity was concerned exclusively with the properties of the electronic configuration outside of the nucleus. The results obtained at the Bureau, together with an independent discovery of the same phenomenon in other mercury isotopes at Rutgers University, have, however, definitely established the validity of the nuclear effect.

Because there has been no adequate theoretical explanation of superconductivity the National Bureau of Standards is now making studies to seek a more complete explanation of this and other low-temperature phenomena. In the course of the studies it was suggested that the transition temperatures at which different isotopes of the same element become superconducting should be investigated to determine whether the mass of the atomic nucleus has any effect on this temperature.

The transition temperatures of the mercury samples were not measured directly but, instead, the critical field was measured as a function of temperature in the neighbourhood of the normal, or zero-field, transition temperature. Then, by extrapolating to the zero field, the normal transition temperature was accurately determined.

In measuring the critical field, use was made of the Meissner effect, or zero induction property (which prevents the existence of a magnetic field). The superconductor, a long needle of mercury sealed in a thin capillary tube, was placed inside a pick-up coil and both were immersed in liquid helium within a Dewar flask surrounded by liquid air. The pick-up coil was then connected to a ballistic galvanometer.

The critical field for a given temperature was then found by slowly increasing the current in a set of Helmholtz coils surrounding the liquid air bath. When the critical field was reached the specimen suddenly lost its superconductivity and was penetrated by the magnetic field of the Helmholtz coils. The resulting change in flux linkages in the pick-up coil induced a voltage, recorded by the galvanometer.

By varying the pressure within the Dewar flask of liquid helium, the temperature of the specimen was controlled in the range between 1.5° and 4.2° K with relative ease. The experiment was repeated at a number of different temperatures, and the critical field was determined for each temperature. The critical field was then plotted against temperature, and the resulting curve was used to determine the transition temperature of the material under study. In this way it was found that pure Hg^{198} has a zero-field transition temperature of 4.177° K as compared with 4.156° K for natural mercury.

No Gold Contamination

Experiments were then carried out to confirm that the observed effect was not due to chemical impurities in the mercury. It had been prepared by bombarding gold with neutrons and there was some possibility of residual gold contamination. At another stage 0.1 per cent of gold was added to some natural mercury and the critical field curve of this material was determined. It was found that there was, in fact, no difference between the curve for pure natural mercury and that for mercury with added gold. Gold contamination, if present in Hg^{198}, was, therefore, unimportant.

Since the initial discovery of the isotope effect in the superconductivity of mercury, a sample of tin consisting principally of Sn^{124} has been investigated at the Bureau and found to exhibit a similar shift in trans'tion temperature.

CRITICAL STUDIES OF NEW INSECTICIDES

Colonial Research Progress

PROGRESS in research of many kinds is comprehensively reviewed in *Colonial Research* 1949-50, published by HMSO.*

The third annual report of the Colonial Insecticides, Fungicides and Herbicides Committee under the chairmanship of Professor P. A. Buxton, who succeeded Sir Ian Heilbron in August, 1949, gives a detailed review of the research work.

A team of one chemist and two entomologists at Porton, near Salisbury, investigated the aqueous suspension of insecticides and the formation and properties of DDT crystals. The results obtained are regarded as being of important critical significance and should lead to the production of more effective and economical insecticide formulations.

Compound 497

Other studies included the chemical and physical properties and the initial and residual contact toxicities of a number of insecticides. That with most insecticidal activity is Compound 497. This has an initial toxicity of the same order as that of the gamma isomer of benzene hexachloride, but is more persistent.

A detailed study of miscible oil formulations was made, so that such components as solvents, emulsifiers, stabilisers and adhesives of a wide variety of types could be tested in preparation for work upon the effects of the various constituents of emulsions on their effectiveness and residual action under varying conditions.

The report notes that the standing of natural pyrethrum had undergone a considerable change during the past year. The insecticidal value of the pyrethrum flowers is due to the presence of two constituents, pyrethrin I and pyrethrin II. These are not homogeneous as was first shown by La Forge and Barthel, and the other constituent was designated cinerin I and II.

Recently in a laboratory of the United States Department of Agriculture an ester closely related to cinerin I had been synthesised. It was now being produced on a commercial scale and its insecticidal properties were under investigation.

While the original estimate of its value was undoubtedly too optimistic, the report observes, there would appear to be little doubt that it, or some other closely related synthetic product would, in due course, prove to be a serious competitor to the natural insecticide. Working under Dr. S. H. Harper's supervision at King's College, Miss N. W. Lowe had prepared a number of standard extracts of the pyrethrins for spectrographic assay with the object of devising a new method of analysis. These samples were being studied.

The East African Tsetse and Trypanosomiasis Research and Reclamation Organisation is embarking upon a new programme of tsetse research, making use of methods recently evolved.

The visits of two representatives of the United States Economic Corporation Administration to East and West Africa during the year had produced a number of useful proposals for additional research with dollar assistance.

A number of experiments had been carried out with Antrycide, chiefly with the object of discovering its prophylactic value. It was not yet possible to evaluate these results, but the difficulties in the way of prophylactic application must of necessity be great, and it was important that they should not be allowed to obscure the great potential value of further research into its curative properties.

Collated Information

During the year 40 correspondents with the Water Pollution Research Laboratory (DSIR) had been nominated by Colonial Governments. As a result, the number of requests for information and assistance received by the laboratory from Colonial territories had greatly increased. Inquiries had been received on a wide range of problems, including the treatment of difficult waters for supply, the treatment of trade waters, and the prevention of pollution of rivers. Much interesting information on the conditions of water supply and waste disposal had also been received.

Altogether 76 new research schemes and 67 supplementary schemes were made during the year and £1,814,124 was allocated out of Colonial development and welfare funds, bringing the cumulative allocation since 1942 to £7,727,979.

Of the total allocations the main percentage distributions were: 32.5 for agricultural, veterinary and forestry schemes; 14.4 medical research; 7.6 tsetse and trypanosomiasis; 6.5 insecticides; 4.1 anti-locust.

* Cmd 8063 3s. 6d.

HIGH-EFFICIENCY VACUUM METHOD

Simple and Effective Concentration of Aqueous Solutions

by Dr. M. A. PHILLIPS, F.R.I.C., A.M.I.Chem.E.

THE effectiveness and some other important advantages of vacuum concentration for the relatively numerous occasions when it is necessary to concentrate thermolabile aqueous materials deserve more attention than they receive. When freeze-drying or spray-drying are impracticable the cheap and simple plant required for vacuum concentration has much to recommend it.

Freeze-drying is expensive both in capital outlay and in running. That is perhaps one reason why some forms of penicillin are now obtained by high vacuum concentration of aqueous solutions in place of the older and, according to some workers, obsolescent, freeze-drying.

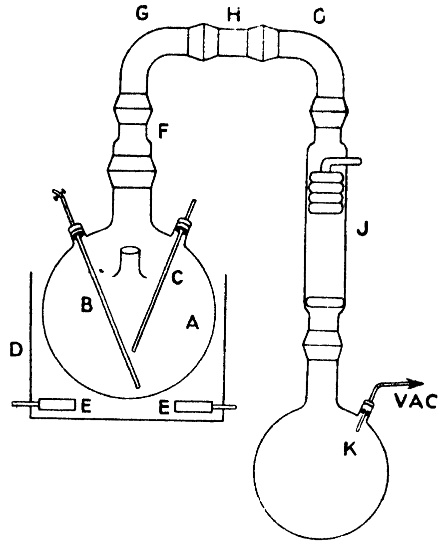
The general principles of design of a still for the rapid concentration of aqueous solutions at low temperatures using reduced pressure are well known. These include the use of wide diameter still heads, good pumps, well-designed condensers, etc., and, if the physcal constants of the solution to be concentrated are known, the design can be calculated. It often happens, however, that the constants are not known and also that there may be other factors which cause performance to lag behind the theoretical.

The following description of a practical experiment in low temperature vacuum concentration may be of assistance to other workers who have similar problems.

All-Glass Plant

The all-glass apparatus consisted of a 50-l. Quickfit and Quartz standard flask fitted at its 4 in. neck with a 4 in. to 3 in. adapter and thence to a vapour lead made from two 3 in. right-angled bends and short 3 in. diameter extension piece. These in turn were connected to a standard Quickfit and Quartz glass condenser of 3 in. diameter (type HEC 422/3/4) with cooling surface of 3 sq. ft.

The lower end of the condenser led to a 20-l. flask as receiver. This had a 3 in. neck, but earlier experiments using a reducing adapter and fitting the condenser to a $1\frac{1}{2}$ in. neck showed that the reduction of diameter at this point had no effect on the efficiency of distillation—as was to be expected if condensation was adequate. The need for wide diameters is, of course, in the vapour lines.



Low temperature vacuum apparatus: A 50-l. flask; B bubbler; C thermometer; D water bath; E immersion heaters; F adapter 4 in. to 3 in.; G right-angle bends 3 in.; H extension piece 6 in.; J condenser, type 422-3-4; K receiver, 20-l flask

As a vacuum gauge, a simple "pull-up" type of mercury column was used; if in the reservoir of this gauge is placed a little syrupy phosphoric acid (0.5 cm. depth) the mercury is protected from oxidation and other contamination for a considerable period. The still was fitted with the usual bubbler tube and with a dipping thermometer and vacuum was applied by a standard Edwards 4-jet water pump fed from high-pressure water mains.

The water bath was heated by two or three immersion heaters, each of 1.5 kW loading; an Isomantle in place of the bath and immersion heaters would have been very convenient if controlled by a Simmerstat.

The following observations were made:

Liquid used: 5 per cent solution of a sodium salt of a common organic acid, 25 l. volume.

Condenser water in at ...	... 15° C.
Condenser water out at	... 25° C.
Condenser water, rate of flow ...	60 gal. per hour.

(*continued overleaf*)

Internal temperature of distilling liquid	30° C. to 32° C.
Water bath temperature ...	65° C.
Water pump, rate of water flow	180 gal. per hour.
Vacuum	15 mm. Hg. absolute.
Rate of distillation—at beginning	5 l. per hour.
at end ...	3.5 l. per hour.
mean ...	4.25 l. per hour.
Temperature of condensed distillate	16° C.

The temperature of the water bath was then raised to 90° C. and the following observations were made:—

Condenser water in at	16° C.
Condenser water out at ...	23° C.
Condenser water, rate of flow ...	80 gal. per hour.
Internal temperature of distilling liquid	30° C. to 32° C.
Water bath temperature ...	90° C.
Water pump, rate of flow ...	180 gal. per hour.
Vacuum	15 mm. Hg. absolute.
Rate of distillation—at beginning	6.4 l. per hour.
at end ...	5.4 l. per hour.
mean ...	5.7 l. per hour.
Temperature of condensed distillate	17.5° C.

Refrigeration of the receiver by an ice-water bath increased the rate of distillation in the second case quoted by about 10 per cent, the distillate being at a temperature of 12° C. It is clear that the condenser was by no means overloaded.

A final experiment in which the water bath was actually boiled and the receiver refrigerated and the condenser feed water rate increased to 100 gal. per hour gave a mean distillation rate of about 8 l. per hour; the temperature of the distilling liquid was 35° C. and of the distilled liquid 18° C.

In no case was any attempt made to concentrate to dryness and the rates of distillation referred to are those observed in concentration from 5 to about 15 per cent. The rates of distillation would have fallen considerably in all cases as the concentration of the material was increased.

Microchemical Apparatus

THREE new British Standards concerning microchemical analysis (B.S. 1428:1950:A.1, D.2 and D.3, 2s. each) have just been announced by the British Standards Institution.

These three standards are the first of a comprehensive series on microchemical apparatus to be published. The growth of microchemistry in recent years and the increased manufacture of microchemical apparatus has made it desirable to undertake a systematic review of the methods in use. The aim is to determine which of these methods are likely to find a permanent place in microchemical practice, and to specify constructional and dimensional requirements so as to provide standards for properly constructed apparatus. This will help to eliminate uncertainty as to the accuracy of results.

Group A of the series comprises combustion trains for the determination of elements, and part A1 describes the standard Pregl type of carbon and hydrogen train. A general assembly drawing is included as well as dimensional drawings of the main components. A pre-heater is recommended and a type of flowmeter is described as an optional alternative to the pressure regulator and bubble counter. Requirements of the quality of glass for the combustion tube and of the rubber tubing are included.

Volumetric microchemical apparatus is included in Group D, of which part D1 was published in 1948 as B.S. 846, Part 3: Burettes with pressure-filling device and automatic zero. In accordance with current practice for standards on volumetric glassware, only the essential details are mandatory and most of the dimensions are given for the guidance of manufacturers.

Part D2 describes pipettes calibrated for content and designed to facilitate the washing out of a measured quantity of liquid. Standard sizes listed are 0.1, 0.2, 0.5 and 1 ml., and the design is such that a single size of plunger will serve for all. The approved methods of using these pipettes, both with and without the plunger, are described in an appendix.

Part D2 describes pipettes calibrated for type of micro-nitrometer for use with the micro-Dumas nitrogen combustion train (to be published shorty as Part A2). The total capacity of the graduated tube is 1.5 ml., each division representing 0.01 ml. A porcelain stand and a caustic potash levelling vessel with a plastic support, convenient for use with nitrometer, are described in an appendix. Detailed drawings of the nitrometer and the ancillary apparatus are included.

A new British Standard for one-mark bulb pipettes (B.S. 1583:1950) has also been announced. Sixteen sizes of pipette from 1 ml. to 100 ml. capacity are specified. These pipettes are most in demand for general laboratory use. Full dimensions are given, but in accordance with current practice in British Standards for laboratory glassware, only the essential ones are listed as mandatory, the remainder being given for the guidance of manufacturers. Standard methods are included for the determination of capacity and delivery time. Tolerances are listed for both. An appendix gives the recommended sizes of glass tubing.

MODIFIED HOT-AIR DRIERS

A Simple Belgian Design

HOT air driers of simple design, using producer gas and permitting economical operation have been designed by M.-G. San and produced in collaboration with Belgian manufacturers. The description of the new driers (*Chemie et Ind.*, 64, 310-314) suggests that they are capable of producing useful economies, having an efficiency of up to 90 per cent, using cheap local fuel and requiring no independent motive power.

They appear to be specially suited for colonial conditions, as in the Belgian Congo, but are not devoid of interest for most advanced industrial countries.

The author has noted some of the disadvantages of the usual methods using pipes heated by steam or other medium. He indicates that among the main features of the new gas driers are elimination of all piping, total use of heat of combustion, except that lost through the walls of the gas producer, so that thermal efficiency is high, space and equipment are saved. Temperature control is said to be easy. The design will probably best be understood by reference to the accompanying sketch of an industrial driers, as manufactured in Belgium. Fuel container 6 has an opening at top 8, with chimney 9, an opening at 7, ash outlet at 1, hearth and air inlets at 2 and 3, refractory lining 5, air inlets at 10, 11 in chamber 12, of which the first directs air to fuel in C, while the second assists combustion of the gas produced which takes place in 12.

Moderating Temperature

The burnt gas passes into a mixing chamber 15, in which are several openings at bottom and top; the former at 13 permit entry of gaseous fluid from outside which mixes with the hot gases from 12 and passes out through top openings 14. Temperature is thus moderated and prevented from rising too high to damage the walls of 15.

The gas mixture passing out at 14 mixes with the surrounding gas medium at D and heats it. Owing to the fairly generous dimensions provided from air inlet 3 to outlet 14, losses of fuel are small.

It is claimed that more efficient combustion is ensured by direct burning of part of the fuel at C, admitting air at 10. Two zones are thus formed: A is the true

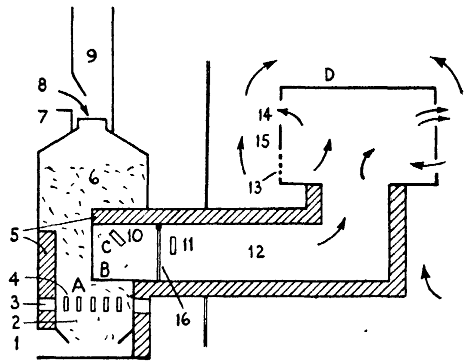


Diagram of the drier, showing circulation of gases round the mixing chamber

combustion zone, and B is a reduction zone for gas coming from A. As ash passes downwards the surfaces at C have always fresh fuel from container 6, and natural draught ensures proper circulation of gases.

When lighting up, a shutter at 16 closes the connection between producer and chamber 12 and at the same time the feed inlet at 8 is opened, permitting escape of smoke, etc., through 9. In about 30 minutes to one hour combustion is well established and reduction zone B becomes incandescent, as can be seen through sighting hole or window. Shutter at 16 is then withdrawn and opening 8 closed. Gases pass then into 12 where they are burnt and normal operation proceeds.

Use of Cheap Fuel

It is observed that the relatively large passages guarantee not only sufficient natural draught without fans or exhausts (*i.e.*, motive power) but also prevent undue contamination with dust and ash because of low gas velocity. Various cheap local fuels may be used, in the colonies, dry wood, vegetable waste, etc. Coke also may be employed, but coal usually is unsatisfactory. Combustion is controled by regulating the admission of air. Once the desired temperature is obtained this control needs little further attention, and temperature variations are only of a few degrees.

Use of the drier for pyrethrum flowers, for tea, coffee, and general industrial purposes is described.

ANALYSIS OF THE ALKALI METALS

The Detection and Determination of Sodium and Potassium

SODIUM is generally determined with one of the triple acetate reagents. As recently as 1928 Barber and Kolthoff advanced the first completely satisfactory method for the determination of sodium. The sodium was precipitated as sodium zinc uranyl acetate and the precipitate weighed. A good conversion factor for sodium was obtained and, indeed, the method is still extensively used according to the procedure outlined in the original paper. Several workers have used other divalent metals in place of zinc, *e.g.*, magnesium and nickel, but these do not offer any advantages over the zinc reagent.

Duval's Work

Mention may be made of the thermogravimetric work of Duval, who stated that sodium zinc uranyl acetate loses its 6 molecules of water of crystallisation between 75° C. and 118° C., and that the precipitate should be ignited to the pyrouranate 1/2 $U_2O_7Na_2.U_2O_7Zn$, which is formed at 360° C. and remains at constant weight up to 674° C. As this revolutionary work contradicts that of countless workers who have been drying triple salt precipitates at 105° C. since 1928, it would seem that an immediate investigation is required.

Copper uranyl acetate is of interest. Lithium is precipitated along with sodium by the usual triple salt methods, but remains in solution if copper uranyl acetate is used as precipitant. In other words, a quantitative separation of sodium from lithium may be achieved.

At the present time, it is not known with certainty if calcium interferes with the determination of sodium as triple salt. Miller and Traves, who were the first to apply the triple acetate method to the determination of sodium in silicates, stated that calcium caused a slight positive error. Wiggins and Wood, on the other hand, obtained slightly low results in presence of calcium, while Haslam and Beeley found that calcium did not interfere in the determination.

* Summarising the proceedings of the first meeting, in Birmingham, of the newly formed Midlands Analytical Methods Discussion Group. The speakers were Mr. R. Belcher, senior lecturer in analytical chemistry, Birmingham University, and Mr. G. Cummings, British Ceramics, Ltd., who summarised from the academic and industrial viewpoints, respectively, the methods now in use for the detection and determination of the alkali metals.

In view of these conflicting statements, it would seem that a titrimetric finish is preferable if calcium is present. Several titrimetric methods for the determination of triple salt have been proposed, based on the following reactions:—

(1) Iodometric titration of the zinc ion.
(2) Reduction of the uranyl ion and subsequent oxidimetric titration.
(3) Distillation of the acetate ion, followed by alkalimetric titration.
(4) Direct alkalimetric titration of the triple salt.

Of these four reactions, the last is undoubtedly the most convenient. Under the conditions used by Morton, nine molecules of sodium hydroxide will react with one molecule of triple salt. The equation for the reaction is as follows:—

$$NaZn(UO_2)_3 (CH_3COO)_9.6H_2O + 9NaOH = 2UO_2(OH)_2 + Zn(OH)_2 + 9CH_3COONa + NaHUO_4 + 7H_2O$$

The maximum amount of sodium Morton determined was 1 mg. More recently, Belcher and Nutten have carried out a potentiometric investigation of the reaction, and have extended the method to the range 1-20 mg. of sodium. If a dilution of less than 1 mg. per ml. of triple salt is used, the stoichiometry of the reaction breaks down and low results are obtained.

Other Reagents Proposed

Several other reagents have been proposed for the detection and determination of sodium; for example, fluosilic acid, fluoaluminic acid, fluoferric acid, 6,8-dichlorobenzoylene urea and resorcinol sulphonic acid, but none of these is as efficient as the triple salt procedures and, indeed, fluoaluminic acid will not detect sodium at a concentration of less than 4 mg. per ml.

For the determination of sodium in refractories the method generally used for opening out the material is the well-known Lawrence-Smith procedure. Some workers state that, if the amount of aluminium in the refractory is less than 7 per cent, then the Berzelius hydrofluoric acid decomposition method should be used, while, if the aluminium content exceeds 7 per cent, the Lawrence-Smith method is to be preferred.

The Lawrence-Smith procedure suffers

from two disadvantages: (1) The high relative blank with low alkali contents, and (2) Materials such as felspar containing 12-14 per cent alkali metal oxides require two sintering operations for complete extraction of the alkalis.

These disadvantages may be avoided by using the methods of Marvin and Woolaver and of Kallmann.

Marvin and Woolaver's method consists of dissolving the silicate in perchloric and hydrofluoric acids. The resulting perchlorates are evaporated to dryness and ignited at 500° C., at which temperature aluminium, iron, titanium, magnesium and manganese are converted to oxides, whereas sodium, potassium and calcium give the corresponding chlorides with evolution of oxygen. On leaching the decomposed perchlorate with slightly alkaline hot water a solution is obtained which contains only sodium, potassium and calcium. The solution is thus similar to that obtained after the Lawrence-Smith extraction.

Kallmann's Method

Kallmann uses a perchloric-hydrofluoric acid decomposition together with the Willard and Smith reagent (20 per cent HCl in anhydrous n-butanol), for separation of the alkalis from other metal ions. The perchlorate solution obtained from the decomposition is evaporated just to dryness and the residue treated with n-butanol. The potassium and some sodium remain out of solution as perchlorates, and the remainder of the sodium is precipitated as chloride with Willard and Smith's reagent. Aluminium, calcium, magnesium, iron and manganese, and small amounts of titanium, zinc and phosphorus do not interfere.

The resulting precipitate can be filtered and ignited at 600° C. to the " mixed chlorides," in which potassium is best estimated as perchlorate in n-butanol-ethyl acetate, and sodium as triple salt. Barium and lead interfere and must be removed before precipitation with Willard and Smith's reagent. Lithium remains in solution and so may estimated in the filtrate.

Potassium Determination

Potassium has more insoluble salts than sodium and, consequently, more methods for its determination are available. The four reagents which have hitherto been most extensively used for the detection and determination of potassium are tartaric acid, chlorplatinic acid, perchloric acid, and sodium cobaltinitrite.

Tartaric acid is very seldom used nowadays. It does not give as sensitive a test for potassium as does sodium cobaltinitrite. Chlorplatinic acid gives a good separation of potassium from sodium in alcoholic medium. The precipitate may be determined in several ways; thus, it may be weighed, or reduced with hydrogen. The hydrochloric acid then evolved may be determined alkalimetrically or the residual mixture of platinum metal and potassium chloride may be weighed, or the chloride extracted and determined by one of the many well-known procedures.

Use of Lithium Chlorplatinate

The potassium chlorplatinate precipitate has been claimed by several workers to be inconstant in composition, and, hence, an empirical factor has to be employed to obtain the true weight of potassium in the precipitate. Smith and Shead, however, state that a precipitate of theoretical composition is obtained if lithium chlorplatinate is used as precipitant.

The high cost of platinum militates against the use of this method.

Probably the most accurate method yet proposed for the determination of potassium is the perchloric acid procedure. Potassium perchlorate is slightly soluble in water but virtually insoluble in certain organic solvents. A mixture of ethyl acetate and n-butanol (4:1) has been claimed by Willard and Smith to be the best solvent for the precipitation, since in this mixture the solubility of potassium perchlorate is least, and that of sodium perchlorate is greatest. Several other cations are precipitated as perchlorates in the same conditions, with the result that a preliminary separation of potassium, generally as cobaltinitrite, or of the interfering cations, is required.

The most common method for the determination of potassium is the well-known cobaltinitrite procedure. Potassium cobaltinitrite is the least soluble known salt of potassium and, hence, is the most sensitive means of detecting potassium. There has been much controversy as to the composition of the precipitate and it has now been established beyond all doubt that the precipitate is not constant in composition. At best, an empirical factor may be employed under certain definite conditions of precipitation, but this is not entirely satisfactory and a new approach to the subject is required.

Lithium may be separated from the other alkali metals by virtue of the solubility of its chloride in certain organic solvents. Acetone, isopropyl alcohol, and cyclohexanol are particularly effective solvents for this extraction, though extreme care must be taken that the solvents are absolutely dry.

Technical Publications

THE suitability of metal unit laboratory equipment for export because of its adaptability and the minimum skilled labour required for installation is recalled by the latest illustrated leaflet "Metal Unit Laboratory Furniture" iussed by Baird & Tatlock (London), Ltd. The corrosion resistant steel construction of the furniture is an asset in tropical and sub-tropical climates, while the unit system facilitates transport and shipment. The company now has orders for equipping three laboratories in Canada—the Department of Health, and the National Research Council, Ottawa, and the Admiralty Research Laboratories, Halifax. They are worth together well over a quarter of a million dollars.

* * *

CLASSIFIED lists of chemicals, showing the makers of each kind, are to be found in the 82nd edition of the *Chemical Manufacturers Directory*, which is now on sale (Simpkin Marshall, Ltd., 5s. 6d.). Also given in the directory are separately annotated lists of the chemical manufacturers in England and Wales and in Scotland and Ireland.

* * *

RADIOACTIVE materials, mineral resources, alkali, coal, natural gas, petroleum, and salt mining are dealt with under the "Mining Laws of Canada." This is a digest of Dominion and provincial laws and regulations affecting mining (44th edition) prepared by Arthur Buison, and just published in Ottawa by the King's Printer and Controller of Stationery (price 50 cents.)

* * *

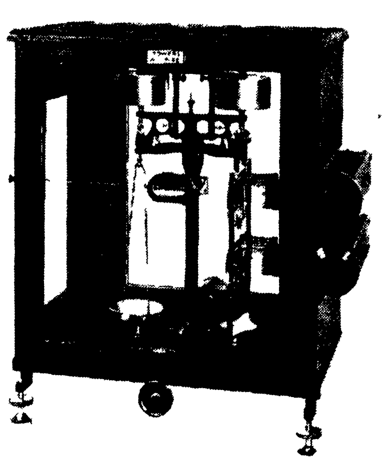
"RECENT Advances in Virus Research," by Professor Wendell M. Stanley, professor of biochemistry and director of the virus laboratory, University of California, is included in the report for 1949 of the Smithsonian Institution, Washington, D.C. The report also contains an important and reasonably up-to-date survey by Carl D. Anderson, California Institute of Technology of "The Elementary Particles of Physics."

* * *

TECHNICAL information for users of tin has been prepared in a number of publications by the Tin Research Institute. These have been listed for convenience under three main groups—for the practical user, the analyst, and the research worker.

TUNG-oil—its production, consumption and application—is the subject of an article by G. W. T. de Mattos in the autumn number of *Colonial Development* (Vol. 1, No. 3), the quarterly magazine of the Colonial Development Corporation. A map and text summarise the various operational undertakings by territories and divisions of the corporation. No mention is made of the ground nuts scheme.

ELECTRON microscopy has expanded so rapidly that published bibliographies are already out of date. A new compilation of technical literature on the subject has accordingly been issued by the National Bureau of Standards and is now available from the U.S. Government Printing Office. "Bibliography of Electron Microscopy" (Circular 502, 87 pp., 25 cents.) has been broadly grouped into size categories: Books, survey articles, instrumentation, electron optics, related instruments and applications.



[By courtesy of J W Towers & Co, Ltd.

This fully automatic balance (Model 98A), has mechanically operated weights up to 100 gm. The operation of the rider weights uses a parallelogram movement, giving a straight lift. This is an improvement on the usual arc or semi-circular movement. Readings are made direct to 0.1 mg. (half a division) without the use of a vernier

OVERSEAS CHEMISTRY AND INDUSTRY

THE BRAZILIAN MARKET FOR CHEMICALS

Improved Prospects for U.K. Sodium Products

THE recent U.K.-Brazilian trade agreement provides for the export from this country to Brazil, in the year ending June 30, 1951, of goods to the value of £33.16 million f.o.b., as well as sales of oil, petroleum and petroleum products by British controlled oil companies to the value of £11.46 million. It invites imports from Brazil of £51.44 million f.o.b. Payments will be in sterling. The difference of £6.82 million has been allowed to offset the normal deficit in Brazil's balance of payments with the United Kingdom. The schedule of exports from the U.K. includes coal, iron and steel manufactures, non-ferrous metal manufactures, chemicals, machinery, vehicles, textiles, pottery and other consumer goods.

BRITISH exports to Brazil of chemicals, drugs, dyes and colours have more than doubled in value in two years, the total for 1949 *being* £2,771,902, *compared with* £1,638,622 *in* 1948 *and* £1,056,916 *in* 1947. *There are good prospects that the* 1950 *total will be much higher; the figure for the first half of the year was* £2,124,319 *and for the nine months to September was* £3,993,839. *Almost a half of this last total was accounted for by caustic soda* (£1,346,695) *and sodium compounds, including carbonate, soda crystals, soda ash and bicarbonate* (£423,870).

The following sums are allotted for exports of chemical products to Brazil: Unspecified organic products, £200,000; soda ash, £500,000; copper sulphate, £100,000; sulphites, hydrosulphites and hyposulphites, £100,000; aniline dyes, except sulphur black, £300,000; caustic soda, £1.2 million; pharmaceutical products, £400,000; unspecified inorganic chemical products £600,000; insecticides and similar preparations, £150,000.

The gross chemical products allotment total of £3.55 million is approximately £900,000 more than the value of shipments by the U.K. to Brazil prior to the devaluation of sterling. The schedules may well be exceeded if Britain is able to increase supplies, as exports from the U.S.A. are being restricted owing to the international situation. Imports of these products by Brazil amounted to £6,727,000 during the first four months of 1950, but supplies on hand are barely sufficient for three months.

The Brazilian Confederation of Commerce has petitioned the president of the Republic to facilitate stockpiling of caustic soda, soda ash, sulphur and some other essential chemicals. Stocks of soda ash are dangerously low, and importers have cabled the Brazilian Commercial Office in London to try and accelerate shipments. During the first half of this year 19,400 tons of soda ash were shipped from Britain to Brazil, but this is 600 tons less than normal requirements.

Price Control

Brazilian production of aniline dyes is now of the order of 700 tons per annum, but local consumption has reached 1000 tons annually and is increasing rapidly. In view of the existing delicate situation the sale of chemical products in Brazil is now being officially controlled. Importers and re-sellers may add only 30 per cent to the cost by way of profits. The list of controlled products is a long one and includes bicarbonate of soda, caustic soda, phenolic acids and resins, pigments, driers and thinners for paint and varnish manufacturers, soda ash, sulphur and the majority of products used in the pharmaceutical industry.

The Consultative Commission for Foreign Trade announces that manufacturers of glue for plywood may import up to 500 tons of casein during the remainder of the season, but only from soft-currency countries. Among other items which are to be imported exclusively from such countries are caustic soda and zinc oxide. Pharmaceutical products of British and American origin used in the treatment of leprosy, malaria, verminous and certain parasitic diseases are now exempt from payment of the excise tax in Brazil.

Among the Brazilian products to be shipped to Britain under the new trade agreement, and the sums allotted, are: oiticica oil, £272,000; tung oil, £100,000; ipecacuanha, £78,000; menthol, £577,000; copaiba oil, £5000; sassafras, bois de rose

and peppermint oil, £225,000; various essential oils for processing and re-export, £40,000; castor seed, £1.5 million; castor seed oil, £800,000; cottonseed oil, £660,000; peanut oil, £120,000.

Since supplies from China and Japan have been curtailed, the price of Brazilian menthol has risen to £12 1s. 7d. per kilo, from £9 12s. in 1949. During the last crop year the production of menthol crystals in Brazil amounted to 80 tons, and stocks on hand are estimated at 40 tons.

Great Britain is the principal buyer of Brazilian peppermint oil, which is extracted exclusively from the *arvensis* variety; 73.5 tons were produced last year. In San Paulo the *piperite* variety is being grown this year to meet the needs of American manufacturers of certain toothpastes. The arvensis oil, even after refining, radically alters the colour and the taste of the preparations in question. The production of other essential oils in Brazil last year was: Eucalyptus 16 tons; bois de rose 304 tons; sassafras 55 tons; vetiver 505 kilos.

Two factories are now producing potassium chlorate in San Paulo, but all the raw materials except muriatic acid are still imported. Although the maximum capacity of the plants is 420 tons yearly, the output is limited to 239 tons. There is little immediate prospect of the industry expanding as the manufactured product (chlorate) pays lower customs duties than the raw material (chlorite). As a result imported chlorate costs less than that manufactured locally. To meet national requirements 16,101 tons of chlorite and 760 tons of chlorate were imported last year, chiefly from Sweden.

Merchandise and samples, of which the value does not exceed the equivalent of U.S. $25.000 in the country of origin, may be sent to Brazil without prior licence, provided they do not call for exchange cover. Since the prior licence system was introduced the number of small parcels entering Brazil has increased enormously. It is a common custom for consignments to be split up into several packages so as not to exceed the permitted value, and payment is arranged directly instead of through the Bank of Brazil.

Developing the Indigenous Oils of Pakistan

PAKISTAN's progressive policy for the fullest production of indigenous edible oils is reflected in several projects indicating willingness to depart from the traditional sources and production methods.

Establishment of a Central Fisheries Department with one section for West and the other for East Pakistan is under consideration. Its duties would be the development of biological and technological research of fisheries.

The fishery resources of Pakistan are considerable but they have not so far been exploited commercially. Experiments, however, show that local fish are suitable for the manufacture of certain products, and that there are good prospects of a fish oil industry being developed.

Of the fish oils so far investigated, shark liver oil is the most important. Sharks are abundant on the East Pakistan coasts. The oil content is often between 60 to 70 per cent of the liver weight of sharks, and the vitamin potency is higher than the average vitamin content of any other fish. Therapeutically and chemically there is no difference between shark and cod liver oil. It is also used for soap-making, tanning and as lamp-oil.

Among other fish oils, punti and hilsa oils are fairly important. The former is exported to foreign markets for industrial uses. The method of extraction has so far been crude and the product obtained of inferior quality, but it can be satisfactorily used in soap-making, paints and varnishes.

Oil extracted from aquatic mammals, particularly the porpoise, is most valuable for lubrication of precision machinery. The fins of large sharks are dried or smoked before they are exported. Isinglass is obtained from air-bladders of several species of sea, estuarine and freshwater fish. The annual quantity of shark fins and isinglass exported from Pakistan is approximately Rs.359,000.

Fish-meal is prepared from small fish not used for human consumption, fish-waste from fish-curing yards and prawn shells. The annual exports of fish manures from Pakistan amount to about Rs. 2 million.

Soap is mostly produced on cottage industry scale in Pakistan. There are about 812 big and small factories which make the country self-sufficient in washing soap. Efforts are being made to enable Pakistan to supply its own requirements of toilet and medicated soaps. One toilet soap manufacturing plant has already been installed in Karachi and another is under construction, while a third is being installed in Bahawalpur.

· OVERSEAS ·

Canadian Beet Sugar Crop

The 1950 sugar beet crop with a total of 155,250 tons announced by the Canadian Department of Agriculture is the highest for the 11 years that the industry has been in existence in Manitoba. The previous largest crop was 128,800 tons in 1942.

Turkey's Underdeveloped Oil

Reports from Turkey indicate that the country's petroleum reserves are now officially estimated to total about 55 million tons. Crude output between 1946 and 1949, however, aggregated only 16,500 tons, of which only 10,500 were refined. Expert opinion in Turkey considers the participation of private foreign and possibly Turkish capital, essential for adequate development.

New Silicon Resin Enamel

A silicon resin enamel, said to have the surface hardness and chemical resistance of porcelain without its brittleness, was recently demonstrated in the U.S.A. at a research conference held at the Glidden Company's laboratory, Chicago. The new finish, which can be both hard and flexible, is not as heat resistant as porcelain, but will withstand much higher temperatures than the customary organic resins.

U.S. Corrosion Testing Station

Investigation of corrosion problems for the U.S. Government service will be carried out at a testing station which has been established at Wilington, North Carolina, operating under the direction of the International Nickel Co. With a new laboratory and the marine exposure racks which have been added at Harbour Island, the section provides facilities for the study of metals, alloys, non-metallic materials and protective coatings in sea-water and sea air.

Italian Patent Law

The Italian authorities are preparing legislation concerning patents and trade marks. It is reported that patent protection will be extended from 15 to 20 years, while the validity of trade marks will be six instead of four years. The principle of compulsory licensing for the utilisation of patent rights is to be introduced. Registrations of patents by Germans are to be permitted again. An official register of advisors on patent matters is to be compiled. The profession of patent attorney is unknown in Italy.

Agar Oil Production in Assam

Investigations by the Indian Forest Research Institute in Dehra Dun have indicated that agar wood grown in Assam may yield agar oil of good quality. A small distilling plant is being developed.

China's Wolfram for U.S.S.R.

Reports from South China state that the authorities have taken steps to increase wolfram-ore output, for which there is heavy demand from the Soviet Union. Most of China's output is now being delivered to Russia. No detailed figures of this traffic are available, but it is stated that some 12,000 tons were delivered at the beginning of August.

Carbon Black in East Berlin

The Hydrocarbon National Corporation in Berlin—Blankenburg (Russian zone of Berlin) is reported to have exceeded pre-war output by producing 1200 kg. of carbon black per day, three shifts being worked. Carbon black from East Berlin is stated to be finding a ready market not merely in the Iron Curtain countries, but also in Scandinavia.

Two New Sulphuric Acid Plants

The Chemical Construction Corporation, New York, has already broken ground for two new sulphuric acid plants to be built for the National Lead Company, New York. One will be located in St. Louis, Missouri. and the other in Sayreville, New Jersey. Both will have capacities in excess of 300 tons per day, which will help to expand the National Lead Company's titanium pigment facilities.

Canadian Industries Expansion

The construction of a new explosives factory in Alberta has recently been begun by Canadian Indus'ries, Ltd., as part of its long-term industrial expansion programme. A study of the manufacture of several chemicals at present imported in large quantities is also being undertaken, and with a view to enlarging its markets, the company is to sell tetra-ethyl lead compounds and other petroleum additives. Total sales for the first six months of this year were considerably larger than those in the same period of 1949. Additional plant capacity for nylon yarn and staple and cellophane cellulose film and other products were brought into operation. The manufacture of polythene film and other new products contributed to the increased sales.

PERSONAL

PRINCESS ELIZABETH, as president of the Royal Society, last week presented the Albert Medal to SIR EDWARD APPLETON, F.R.S., in private audience at Clarence House. It was not necessary to have a deep knowledge of science, said Her Royal Highness, in order to appreciate Sir Edward's abilities and his achievements both in pure and applied science.

The following officers have been appointed to serve the International Scientific Film Association for the year 1950-51: President: JOHN MADDISON (Great Britain); vice-presidents: LUC HAESAERTS (Belgium), and JAN KORNGOLD (Poland); hon. secretary: JEAN PAINLEVE (France); hon. treasurer: MARIO PONZO (Italy). Mr. Maddison is in charge of the distribution of non-theatrical films for the British Government and the Central Office of Information.

COL. H. C. SMITH, deputy chairman of the Gas Council, has been re-elected president of the British Road Tar Association for the fourth year in succession. MR. G. A. HEBDEN, director and general manager of the South Yorkshire Chemical Works, Ltd., who represents the coke oven interests, and MR. STANLEY ROBINSON, chairman and managing director of the Midland Tar Distillers, Ltd., who represents the tar distilling interests, have been re-elected vice-presidents. MR. W. K. HUTCHISON, chairman of the South Eastern Gas Board. is re-elected honorary treasurer. The chairman of the managing council is MR. J. DAVIDSON PRATT, director and secretary of the Association of British Chemical Manufacturers.

The principal speakers at the annual dinner, in London last week, of Faraday House Old Students' Association were: LT.-GEN. SIR RONALD WEEKS, chairman of Vickers, Ltd., and of the National Advisory Council for Education in Industry and Commerce, and SIR NOEL ASHBRIDGE, director of BBC technical services. Past-presidents of the Institution of Electrical Engineers present included the EARL OF MOUNT EDGCUMBE, SIR VINCENT DE FERRANTI, SIR ARTHUR FLEMING and MR. P. V. HUNTER.

PROFESSOR C. CHAUDRON, president of the French Metallurgical Society has been awarded the "Luigi Losana" gold medal of the Italian Metallurgical Association, instituted in memory of the famous Italian metallurgist.

MR. J. E. COLEHAN, research chemist, has been appointed superintendent of the acid plant at Bradford Corporation Sewage Works at Esholt. He was educated at Bradford Technical College.

DR. ANGUS MACRAE, an industrial psychologist, has been appointed secretary of the British Medical Association in succession to Dr. Charles Hill, M.P. for Luton. Dr. Macrae has been deputy secretary since 1948. He was chairman of the BMA committee on nutrition.

MR. A. J. KIRK has joined the staff of the industrial department of Philips Electrical, Ltd. He was previously with Petbow, Ltd., manufacturers of arc welding plant, as commercial manager.

DR. L. J. SPENCER has completed 50 years as honorary editor of the *Mineralogical Magazine.*

DR. P. H. PLESCH has been appointed lecturer in chemistry at the University College of South Staffordshire.

Iron and Steel Arbitration

THE Iron and Steel Arbitration Tribunal, which has been set up to hear and determine disputes connected with stockholders' compensation and other matters under the Iron and Steel Act, has been composed as follows: Legal member and president (except in Scottish proceedings): Sir John Howard; for Scotland: Mr. Douglas Alexander Mortimer. Members of the tribunal for all proceedings: Sir Frederick Alban and Mr. E. C. Ellen.

Obituary

THE death is announced, at the age of 55, of DR. GEORGE ALEXANDER HANKINS, director of mechanical engineering research in the DSIR. He had been on a visit to the department's new £1.5 million research station at East Kilbride, in the construction of which he had been associated. His work on wind-tunnel experiments usefully contributed to the development of aircraft to fly at supersonic speed.

M. LOUIS PINEAU, director from 1925 to 1940 of the French National Office for Liquid Fuels, which he helped to create, has died in Paris, aged 62. He took also a leading part in the establishement of the Ecole Nationale du Pétrole in Strasbourg.

HOME

Shell Chemicals HQ

Shell Chemicals, Ltd., has removed its head offices to Norman House 105-9 Strand, W.C.2. (Tel: Temple Bar 4455).

Steel Production Over 17 m. Tons

British steel production in October was at the annual rate of 17.04 million tons. The last time it was over the 17 million ton mark was in March.

Explosion at Chemical Plant

Two workmen were killed by an explosion on Monday last while working on a chemical plant at Shell Refineries, Stanlow, Ellesmere Port. The plant is in the open, and no damage was done to buildings or other property.

Enlarged Tank Wagon Plant

The Dalzell Electric Welding Company, Motherwell, has extended its operations by the incorporation of a large factory in Bellshill, Lanarkshire, where it will specialise in the manufacture of road tankers for chemical and other liquids.

Tin Price Soaring

Large gains in the price of tin were recorded on the London Metal Exchange throughout the week. On November 6 the Ministry of Supply sold metal for cash in the closing session at £1170 and £1180 per ton. On Tuesday the price rose by over £100 to around £1290 per ton for some types of business.

Increases in Oils and Fats Prices

The following changes in the prices of unrefined oils will apply during the four-week period ending December 2, 1950: Linseed oil, from £134 to £136 per ton; sunflower acid oil, soya acid oil and maize acid oil from £92 to £94 per ton. Prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers will remain unchanged.

New Provincial Branches

Additions and alterations to its local service available for dealers throughout the country is announced by Philips Electrical, Ltd. The Manchester branch is now in larger premises at 40 Little Lever Street. At Liverpool a new showroom was opened on November 3 at 6-10 Leeds Street. In Cardiff there are larger premises at 11-13 Penarth Road and a showroom will be opened shortly. A new lighting depot was opened this week at 27 Landport Terrace, Southsea, Portsmouth.

Dearer Lead

The domestic price of good soft pig lead was increased on November 1 by £8 to £136 a ton. This followed a rise of one cent to 17 cents in the U.S. market.

Midlands Fire Damage

Several thousands of pounds worth of raw rubber, sulphur and aluminium powder were destroyed in a fire at Market Harborough recently. Workmen had to wear protective clothing clearing up and salvaging raw rubber.

Fire in Manchester Fine Chemicals Plant

Normal trading has been resumed at Whitefield, Manchester factory of Theodore St. Just & Co., Ltd., following the recent fire in the fine chemicals manufacturing department, which involved certain new plant then under construction.

Dollars for Sugar-refining Plant

Sugar-refining machinery worth $1 million has been ordered by a Central American republic from a Derby firm. The order includes the world's first complete turbine-driven train containing cane-crushing plant.

Largest Refinery Column

A stripper column, the largest of its kind yet manufactured in Britain, has been completed by Babcock & Wilcox, Ltd., of Renfrew, for the oil refinery project at Stanlow. The column, 132 ft. high, and 11 ft. 3 in. in diameter, had to be conveyed in three sections, the largest of which was 81 ft. and weighed 100 tons.

Cellulose Acetate Containers

Purchase tax is now payable on rigid, non-flexible transparent celluloid and cellulose acetate cases, of a size not exceeding 6½ in. by 4 in., at the rate of 66⅔ per cent for articles of personal or domestic use, and 33⅓ per cent for goods chargeable as stationery and office requisites. Such articles as season ticket, document and menu holders are affected.

Coal Production

Output of coal last week was slightly higher than in the previous week, but the total to date appears to cast doubt on the likelihood of the year's export objective being maintained. Comparative figures are:—Last week: 4,380,100 tons (deep-mined 4,139,000 tons, opencast 241,100 tons). Previous week: 4,377,500 tons (deep-mined 4,119,600 tons, opencast 257,900 tons).

Next Week's Events

MONDAY, NOVEMBER 13

Society of Chemical Industry

London: The Royal Institution, Albemarle Street, W.1, 7 p.m. "The Chemotherapy of Cancer." Professor A. Haddow, Director, Chester Beatty Institute, The Royal Cancer Hospital.

Bradford: Technical College, 7 p.m. "Chemical Processing for the Textile Industry" J. G. Evans. Jointly with the Bradford Chemical Society.

Royal Institute of Chemistry

London: Chelsea Polytechnic, Manresa Road, S.W.3. 7 p.m. The Physical Chemistry of Haemolysis" Dr. J. H. Schulman.

Institute of Metals

Glasgow: 39 Elmbank Crescent, 6.30 p.m. Symposium on Corrosion Experiences, by members of the local section.

Institute of Packaging

Manchester: Grand Hotel. "Collapsible Tubes" J. G. Wilson.

Institution of Plant Engineers

Maidstone: Technical College, 7 p.m. "Corrosion Problems." Dr. Gyngell.

Institution of Production Engineers

Manchester: Grand Hotel, 7.30 p.m. "Mechanical Handling." Jointly with the Institution of Works Managers.

TUESDAY, NOVEMBER 14

The Chemical Society

Belfast: Queen's University, Department of Chemistry lecture theatre. 7.30 p.m. "Some problems in the Chemistry of the Polysaccharides." Professor E. L. Hirst, F.R.S. Jointly with R.I.C., S.C.I. and the Andrews Club.

Institution of Works Managers

Liverpool: Adelphi Hotel, 6.30 p.m. "The Costing of Engineering Services." H. Mason Bibby.

Institution of Plant Engineers

Manchester: The Engineers' Club, Albert Square, 7.15 p.m. "The Application of Colour in Industry." H. L. Gloag, A.R.I.B.A., of DSIR.

Royal Institute of Chemistry

Wigan: Mining and Technical College, 7 p.m. "Partition Chromatography." Dr R. R. Goodall.

Norwood: Technical College, Knight's Hill, S.E.27. 6.30 p.m. Film Display.

Institution of the Rubber Industry

Edinburgh: 25 Charlotte Square, 7.30 p.m. "Safety in the Rubber Industry." Report of the N.J.I.C. Committee.

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 30 p.m. Dr. J. L. Edgar.

WEDNESDAY, NOVEMBER 15

OCCA

Hull: Y.P.I., 7 p.m. Junior Discussion Group.

Royal Institute of Chemistry

Cardiff: "Solid and Catalytic Reactions." Professor W. E. Garner, F.R.S.

London: Waldorf Hotel, Aldwych, W.C.2, 6.30 p.m. Annual General Meeting. Discussion on "Terms of Engagement for Chemists" by R. L. Collett.

Ponders End: Visit to Thomas Morsons, Ltd. (Registered students only.)

Society of Chemical Industry

Birmingham: The University, Edmund Street, 6.30 p.m. "Recovery and Concentration of Acetic Acid in Cellulose Acetate Manufacture." W. F. Hastie.

Institute of Fuel

Manchester: The Engineers' Club, Albert Square, 6 p.m. "The Coal-fired Open Cycle Gas Turbine." W. V. Battock.

Institute of Petroleum

Chester: Grosvenor Hotel, 7.15 p.m. "Carbon Black Manufacture." (With film.) L. W. Cabot and J. W. Edminster.

Institution of Plant Engineers

Liverpool: Radiant House, Bold Street, 7 p.m. "Electronics in Industry." K. Marwood, A.M.I.Mech.E.

Bristol: Grand Hotel, 7.15 p.m. "Engineering Applications of Electro-deposited Metals." J. W. Oswald, A.R.I.C.

Institution of Civil Engineers

London: Great George Street, S.W.1, 6 p.m. "Welded Bridges and Hangers in Spain." Professor Dr. Ing. E. Torroja.

THURSDAY, NOVEMBER 16

Royal Institute of Chemistry

Bristol: Grand Hotel. Social Evening and film show. Jointly with the Chemical Society and SCI.

Leicester: College of Technology, 7.15 p.m. "Research in Artificial Fibres." J. G. N. Drewitt.

Manchester: Midland Hotel. Dinner and dance. Jointly with SCI.

Chemical Society

London, Burlington House, Piccadilly, W.1, 7.30 p.m. Meeting for the reading of original papers.

Hull: University College, 6 p.m. "Recent Theories of Molecular Structure." Professor Sir John Lennard-Jones, F.R.S.

(continued at foot of next page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

FISONS, LTD., Ipswich, fertiliser manufacturers, etc. (M., 11/11/50.) Oct. 6, eight dispositions supplemental to a trust deed dated Sept. 4, 1950; charged on various properties in Scotland. *Nil. Mar. 6, 1950.

LAWRENCE (BRIGHTON), LTD., chemists. (M., 11/11/50.) Oct. 6, £500 deb. Phyllis C. Lawrence, Brighton; general charge. *£500 June 24, 1950.

Satisfactions

A. E. BEILBY, LTD., Nottingham, chemists. (M.S., 11/11/50.) Satisfaction Oct. 12, of mort. reg. Aug. 29, 1949.

WELLCOME FOUNDATION, LTD., London, N.W., chemical manufacturers. (M.S., 11/11/50.) Satisfaction Oct. 6, that specified properties, comprised in a charge registered July 29, 1947, ceased to form part of the company's property or undertaking.

ELCO PLASTICS, LTD., London, E.C. (M.S., 11/11/50.) Satisfaction Oct. 10, of debenture registered July 27, 1950.

Receivership

PH-ENTEX PRODUCTS, LTD., 408a Montrose Avenue, Trading Estate, Slough.

Mr. Chas. E. M. Emmerson, 28 King Street, Cheapside, E.C.2, was appointed receiver and manager on October 9, 1950, under powers contained in mortgage and charge dated July 1, 1949.

New Registrations

Organic Research Chemicals, Ltd.

Private company. Capital £1000. Manufacturers of chemicals, gases, disinfectants, dyes, pigments, acids, drugs, etc. Directors: L. V. Pearkes, J.P., and H. J. F. Weiss. Reg. office: Poyle Trading Estate, Colnbrook, near Slough.

P. B. Kent & Co., Ltd.

Private company. (487,718). Capital £16,000. Manufacturers, importers and exporters of fertilisers, feeding stuffs, etc. Directors: R. T. Todd, Mrs. E. Kent, H. F. Wade and Lady Agnes O. B. Tait. Solicitors: Lucas & Co., Darlington.

Kemp and Staples, Ltd.

Private company. (487,852). Capital £200. Consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: W. H. Kemp, G. E. Staples. Reg. office: 4 Cross Street, Cheadle, Staffs.

NEXT WEEK'S EVENTS

Society of Chemical Industry

London: 11 Upper Belgrave Square, S.W.1, 6 p.m. "The Manufacture of Fletton Bricks." T. G. W. Boxall.

Salisbury: Bishop Wordsworth School, 7.30 p.m. "Colour, Colour Measurement and its Uses in Industry." G. J. Chamberlain, A.C.I.S.

Textile Institute

Nuneaton, Bull Hotel, 7 p.m. "The Manufacture of Viscose Rayon by the Continuous Process." L. Rose.

Institute of Packaging

Birmingham: Imperial Hotel. "Research To-day." Dr. G. I. Riddell, of P.A.T.R.A.

The Pharmaceutical Society

Hull: New York Hotel. Buffet Dance.

FRIDAY, NOVEMBER 17

Royal Institute of Chemistry

London: Connaught Rooms, Great Queen Street, W.C.2, 7 p.m. Annual Dinner-Dance.

The Chemical Society

Glasgow: The University, 7.15 p.m. "Some Problems in Gas Flow and Sorption." Professor R. M. Barrer.

Southampton: University College, 7.15 p.m. "Kinetics of the Bacterial Cell." Sir Cyril Hinshelwood, F.R.S.

Swansea: University College, 5.30 p.m. "Ion Exchange Resins." Professor C. W. Davies.

Workington: 7 p.m. "Manufacture, Distribution and Utilisation of Liquid Oxygen" C. R. Houseman.

Biochemical Society

London: St. Mary's Hospital Medical School. Meeting.

The Stock and Chemical Markets

LATEST news from Korea affected sentiment in stock markets and early in the week sharp reactions were recorded by British Funds. Tin and rubber shares fell back, although further sharp gains were shown by the commodity prices resulting from fears of acute shortages if hostilities spread in the Far East. Share values later recovered moderately, and British Funds also attracted renewed attention.

Industrial shares are showing a steady undertone, reacting to the belief that there may be a change of Government early in 1951. Yields are in many cases fairly generous and there are hopes that dividends will be maintained. That, however, will depend on the trends in taxation and material costs.

Chemical and kindred shares were generally rather more active. Imperial Chemical were steady at 42s. 9d., Monsanto at 51s. and Laporte Chemicals 5s. units changed hands around 10s. 3d. Fisons have been more active up to 29s. reflecting satisfaction with the results and 9 per cent dividend on the larger capital. Albright & Wilson kept firm at 30s., Brotherton 10s. shares further strengthened to 20s. 6d., Boake Roberts 5s. shares were 31s. 6d., and Pest Control 5s. shares 7s. 4½d. Amber Chemical 2s. shares, were 2s. 9d., F. W. Berk 2s. 6d. shares 12s. 9d., and Bowman Chemical 4s. shares were 6s. British Chemicals and Biologicals 4 per cent preference shares were 17s. 6d., W. J. Bush 5 per cent preference 22s. 9d., and L. B. Holliday 4½ per cent preference 19s. 9d., while Woolley 4¾ per cent debentures were 104½.

There was a firmer tendency among plastics and allied shares with British Xylonite at 86s. 10½d. on the good impression created by the interim dividend. British Industrial Plastics 2s. shares firmed up to 6s. 9d., and De La Rue to 24s. 3d. Elsewhere, however, United Molasses eased to 46s. 3d., Turner & Newall at 85s. 3d. were steady again on market hopes that a higher dividend is in prospect, while the 4s. units of the Distillers Co. were well maintained at 19s. 7½d.

British Glues 4s. units further strengthened to 21s. 9d., British Aluminium have been steady at 43s. 3d., with British Oxygen at 90s. 6d. Lever & Unilever have firmed up to 43s. 6d. United Glass Bottle at 76s. 10½d. were again well maintained and Triplex Glass 10s. units remained active at 27s. 1½d. Glaxo Laboratories 10s. units have also been active up to 53s. 6d. Dunlop Rubber eased to 63s. 9d., awaiting full details of the company's big new capital plans. Borax Consolidated at 55s. were well maintained, while British Match shares showed firmness at 33s. 6d.

Iron and steels generally recorded only small movements on balance, although Guest Keen at 48s. responded to the company's higher interim dividend, and Babcock & Wilcox were well maintained at 65s. 3d. Shares of steel companies scheduled for nationalisation were again inclined to recede, although they are well below their " take-over " levels.

Market Reports

THE demand for industrial chemicals for home use and for export has been fully maintained and most sections report a ready outlet for available supplies. The continued tightness of commodities, particularly the non-ferrous metals, is shown in the position of the chemical compounds; a further increase in the controlled price of pig lead has resulted in dearer prices for white and red lead. The new basis prices per ton, operating as from November 1, are: dry white lead £161, ground white lead £177 10s., red lead £154, ground in oil £173 10s., orange lead £166, ground in oil £185 10s. The price of chemically pure glycerin for ton lots in 10 cwt. returnable drums is now 227s. 6d. per cwt. Quotations in other directions are firm, with a tendency towards higher levels. The coal tar products market shows little change of importance; there is still a steady pressure for supplies of most items and no easing of the export demand.

MANCHESTER.—Firm price conditions continue in virtually all sections of the Manchester chemical market and there has been a further stiffening in values of the lead compounds as a result of the higher price of the metal. There is a steady demand for most lines and current delivery specifications, especially for the alkalis, represent a substantial tonnage. Fresh inquiries have been numerous and there have been fair additions to the already heavy order-books. The call for fertilisers is about up to the average for the time of the year and steady pressure for supplies has been reported.

GLASGOW.—There has been a considerable increase in inquiries for chemicals and raw materials during the past week. Increased home demands have affected the export market.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of phosphatic fertilisers, particularly of superphosphate.—E. Potter. (Montecatini Soc. Generale Per l'Industria Mineraria E. Chimica). Oct. 14 1948. 645,674.

Buckets, more particularly for acids and other corrosive liquids.—F. S. Zabala. Oct. 15 1948. 645,742.

Pinchcocks or burette clips.—Universal Woodworking Co., Ltd., and C. Westwood. Aug. 4 1949. 645,814.

Purification of polymyxin.—Wellcome Foundation, Ltd., and S. Wilkinson. Nov. 30 1949. 645,750.

Manufacture of stable emulsions of artificial resins.—Ciba, Ltd. Nov. 30 1948. 645,926.

Stabilisation of dialkyl haloacetals.—General Aniline & Film Corporation. Dec. 14 1948. 645,680.

Extraction of organic compounds dissolved in water.—Ransom & Son, Ltd., and R. A. G. Stockdale. May 11 1948. 645,928.

Devices intended to effect the penetration of an object by the detonation of an explosive charge on the exterior thereof, for military and like uses.—I.C.I., Ltd., and J. Taylor. Aug. 9 1944. 645,611.

Metallurgical processes for producing materials or articles of platinium or allied metals, or their alloys, and materials or articles made by or from the products of such processes.—Lodge Plugs, Ltd., and C. J. Smithells. Oct. 24 1944. 645,541.

Method and apparatus for coating articles by electrostatic deposition.—H. J. Ransburg, H. G. Ransburg, H. P. Ransburg, and E. M. Ransburg [trading as H. J. Ransburg Co.]. Jan. 23 1946. 645,512.

Lubricants comprising organosilicon compounds.—F. J. Sowa. Nov. 22 1946. 645,339.

Preparation of mineral-oil solutions of calcium or zinc salts of dithiophosphoric acid esters.—American Cyanamid Co. Jan. 7 1947. 645,345.

Sodium-vapour darkroom lamps.—Philips Lamps, Ltd. Jan. 20 1947. 645,346.

Alpha-acyclamido acetic ester compounds.—Merck & Co., Inc. Jan. 25 1947. 645,402.

Method for the separation of wax from crude wax and bitumen.—A. F. Sundgren, and E. E. Ekman. Feb. 10 1947. 645,613.

Polymeric material and process of producing same.—B. F. Goodrich Co. Feb. 24 1947. 645,350.

Acid-resisting, micro-porous material and method of making the same.—Oldham & Son, Ltd., and F. Booth. April 15 1948. 645,354.

Polyvinyl acetate and a polymerisation catalyst for use in its production.—Shawinigan Chemicals, Ltd. May 20 1947. 645,405.

Therapeutically active alkaloid preparation.—Sharp & Dohme, Inc. Aug. 7 1947. 645,618.

Bactericidal and fungicidal composition.—Buckman Laboratories, Inc. Aug. 21 1947. 645,409.

Poly-acetoacetyl derivatives of polyamines as azo coupling components in diazotype photoprinting material.—General Aniline & Film Corporation. Oct. 13 1947. 645,495.

Stilbene derivatives for use in whitening textile materials.—I.C.I., Ltd., and R. H. Wilson. Oct. 13 1948. 645,413.

Process for the preparation of a water soluble oestrogenic hormone substance.—Ayerst-McKenna & Harrison, Ltd. Nov. 8 1947. 645,414.

Process for the production of viscose rayon threads.—A. Abbey. (Spolek pro Chemickou A Hutni Vyrobu, Narodni Podnik). Dec. 29 1947. 645,422.

Lubricating compositions.—Aluminum Co. of America. Jan. 9 1948. 645,425.

Methods for the production of sulphanilic acid amide compounds.—A. Benyon A/S. Jan. 19 1948. 645,429.

Process of making vanillin.—Marathon Corporation. Jan. 20 1948. 645,430.

Manufacture of glutamic acid.—International Minerals & Chemical Corporation. Jan. 21 1948. 645,431.

Luminescent materials.—General Electric Co., Ltd., A. H. McKeag, and P. W. Ranby. Feb. 28 1949. 645,502.

Reduction of the powders of the oxides of iron or iron alloys.—Mantle Lamp Co. of America. Feb. 9 1948. 645,435.

Glands for stirred autoclaves.—I.C.I., Ltd., and H. B. Wood. Feb. 25 1949. 645,439.

Fumigating compositions.—I.C.I., Ltd., J. Gillies, and J. Rowe. Dec. 22 1948. 645,440.

Thermoplastic flexible stripping and the method of manufacturing it.—Melwood Thermoplastics, Ltd., and A. W. Meldrum. March 9 1949. 645,625.

Apparatus for separating gas from a liquid and float valves adapted for use therein.—Shell-Mex & B.P., Ltd., and J. W. Ridgeon. March 14 1949. 645,626.

Colouring of aluminium and its alloys.—United Anodising, Ltd., and L. G. Tottle. April 20 1949. 645,443.

Heat hardening of pellets of iron ore concentrates.—Erie Mining Co. March 23 1948. 645,444.

Method and apparatus for coating articles by electrostatic deposition.—H. J. Ransburg, H. G. Ransburg, H. P. Ransburg, E. M. Ransburg [trading as H. J. Ransburg Co.] and R. C. Noyes. Jan. 28 1946. 645,629.

Separation of dimethylphenols.—Monsanto Chemicals, Ltd., E. Roberts, and M. J. Rose. Jan. 25 1949. 645,446.

Electrolyte for and method of anodically polishing aluminium.—Battelle Development Corporation.—April 26 1948. 645,453.

Insecticidal compositions.—N.V. De Bataafsche Petroleum Maatschappij. May 28 1948. 645,458.

Casein products.—B.X. Plastics, Ltd., P. G. T. Hand, A. E. Judd, and V. I. Furness. May 4 1949. 645,461.

Centrifugal separator and a method for the use thereof.—Separator A/B. June 4 1948. 645,463.

Interference microscope.—J. St. L. Philpot. May 24 1949. 645,464.

Preparation of siloxanes.—Soc. des Usines Chimiques Rhone-Poulenc. June 15 1948. 645,389.

Production of artificial protein threads, filaments and the like.—Courtaulds, Ltd., L. E. Hodges, C. L. Knight, W. Walker, and R. L. Wormell. June 14 1949. 645,390.

Shaped explosive charge.—E. I. Du Pont de Nemours & Co. June 18 1948. 645,466.

Treatment of cellulose esters to improve their resistance to degradation by sunlight and ultra-violet light.—Courtaulds, Ltd., W. G. Cameron, and L. F. H. Breens. July 20 1949. 645,392.

Manufacture of mixed phosphatic fertilisers.—Spolek Pro Chemickou A Hutni Vyrobu, Narodni Podnik. Aug. 4 1948. 645,468.

Process for inhibiting acid attack on brick and the like.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 18 1948. 645,470.

The
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Who Will Teach?

A GREAT deal has been said and written since the war about expanding Britain's facilities for technological education. Whether some people think that progress is too slow or whether others feel that it is satisfactory, it will be generally agreed that there is a new and healthy determination to develop this field of scientific training. Much less is said about the steadily crumbling foundation upon which all this effort must be built. At the risk of sounding childishly obvious, let it be pointed out that scientific education begins in the schools.

However urgently industry may require the products of technological colleges, however many young men and women there may be with some aptitude for scientific subjects, the whole process is bottle-necked at its most fundamental stage if there are not enough people prepared to teach. The fact has long been clear—qualified scientists, particularly chemists, can decide to devote their lives to teaching only if they accept severe economic penalties.

The newly proposed awards of the Burnham Committee do not rectify this long-standing and painful position. There are two problems involved. One is the general and increasing disparity between teachers' rewards and those obtained for other kinds of work and service, a disparity which increases sharply with every upward surge of the cost of living. The other problem is more specifically related to the teaching of science. It is what Sir Ewart Smith described this year at the annual proceedings of the British Association as the growing unbalance between the rewards offered in industry and teaching.

In the case of a number of subjects taught in schools, the annual demand for teachers dominates the employment market; this can even be true of scientific subjects, as the recent technical report from the Ministry of Labour on biology has shown. In chemistry this is certainly not the case. A large and varied offering of posts in industry and in other forms of Government service is offered to each year's university output of graduates. The salaries and the prospects offered by these posts are not just slightly superior to the Burnham scale offerings; they are incomparably superior. Unless something is done to meet this acute and specific situation, it will not be long before the teaching of chemistry at Britain's schools is virtually bereft of new recruits and gradually brought to a standstill.

Here is yet another example of the muddle and misfortune that always follows " planned adjustments " of the

On Other Pages

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law of supply and demand. It is no doubt convenient that the basic rewards for teaching in schools should be scaled to some universal standard without regard for the actual subjects taught. The graduate in languages—dead or alive—must have the same economic treatment as the graduate in chemistry.

If the profession of teaching could exist within an isolated economic universe, such a principle would be both admirable and practicable. It ignores the simple fact that John Smith, B.Sc., can *choose* whether he accepts this rating of his value or whether he takes his chemical knowledge and skill to another market in which its value is assessed against a supply and demand background. John Smith, B.Sc., may want to teach chemistry and he may, with commendable enthusiasm, ignore these economic distortions. If he does this, he is clearly just the kind of man who should make teaching his life's work.

It is not only the great dearth of chemistry graduates prepared to enter teaching that is serious; it is also the wastage caused by resignations, a factor that is seldom discussed but is known, nevertheless, to exist. Unless enough young men are prepared to become and remain teachers of chemistry, there will be fewer and fewer chemists from 1960 onwards.

There are no signs that this problem, despite its national significance, is being constructively faced. The simplest and most direct solution appears to be to create differential and superior rates of pay for the teaching of chemistry and of any other science for which the rewards in industry are so demonstrably more attractive. It is unlikely, however, that such a realistic remedy would be accepted by the teaching profession itself, or by any body concerned with its conditions, until and unless the chemistry teacher had become an almost extinct variety. Indeed, the new Burnham awards have reduced former differentials in the scales of pay; an additional increment is no longer awarded to those teachers who hold first-class honours degrees in their subjects.

Both chemists as a profession and the chemical industry should pay as much attention to the secondary schools as to the technological colleges and institutes. It is in the schools of 1950-60 that British chemistry for 1980-2000 is being shaped—for better or worse.

Notes and Comments

Terylene

ALL that is known about Terylene promotes the belief that this new synthetic monofil, which I.C.I., Ltd., is preparing to produce commercially at Wilton, will prove one of the economically important results of the growth of British petroleum industry. The worldwide demand for textiles and the soaring cost of natural materials, particularly of wool, with which Terylene is thought to compare better than nylon, confirms the good prospects—and incidentally the far sightedness of the research policies of I.C.I. (and the Calico Printers' Association) which now promotes two important substitutes. Terylene differs from Ardil in, among other things, that it is a true "synthetic", owing nothing to the common vegetable sources which provided the first artificial fibres, the rayons. It is basically an ester of terephthalic acid condensed with ethylene glycol. While credit for the initial discovery of the route to this and many other monofils belongs primarily to the brilliant inventiveness of W. H. Carothers, of E. I. Du Pont, it was left to the English chemists to make theory practicable by developing new polyesters which are believed to have rectified the serious defects of the polyamides originally proposed.

Attack on Synthetics

ANTAGONISM to the use of synthetic materials in foodstuffs, of which there has been some evidence here coming principally from the medical fraternity, seems to be gathering in the U.S.A., a much greater force than has been generated here. America, which has been foremost in developing some of these chemical improvers, substitutes and insecticides, now seems intent on discouraging their use. The impulse, however, is far from being as widely shared as that may suggest, and it is not certain that it is entirely disinterested. The "no tolerance" order for DDT in dairy products, in 1949, seems to have been the starting point of the campaign in official circles. It was unfortunate that the ruling should have been preceded by a violent Press campaign against the wide use of DDT as a crop insecticide. Later public hearings called by the powerful Food and Drug Administration covering the whole field of residual hazards and tolerance limits for insecticides and fungicides used in food production have been proceeding during the greater part of this year. There is, of course, good evidence that the toxic properties of some of the new synthetic insecticides deserve independent and judicial investigation, if only to ensure that safe application methods are made obligatory.

Prejudice?

SYNTHETICS are now becoming the target in another field for a broadside by the FDA, which proposes to rule out the use in bread making of synthetic emulsifiers, such as polyoxyethylene monostearate, which has been competing with natural lard and vegetable oils. Much the same could be said about the mono- and diglyceride products produced from the natural oils and fats—but they are exonerated. The case against polyoxyethylene monostearate is suspiciously weak; in bread it is said to deceive the consumer by giving a fresher appearance than the age of the bread should allow—as do the naturally derived glycerides. It is said that the synthetic emulsifier lowers the nutritional value of bread, despite the fact that calorific effect of any emulsifying agent is negligible. Lastly, it is said that the monostearate has not been proved to be non-toxic, although it is admitted that there is no evidence that it has had any injurious effects. There seems in all this to have been strong political pressure from farmers. One political speech com-

plained that " These chemical manufacturers have developed products designed to supplant and replace nature's products, to inject into the food supply of the nation inorganic materials as against the utilisation of organic materials." If reactionary opinion of this kind has influenced the FDA decision the contributions of modern chemistry to the food industries are seriously threatened. Each synthetic product certainly requires to be carefully and impartially judged, but there should be no ready assumption that synthetics are dangerous and natural products safe. It is disturbing that the anti-scientific attitude can exert powerful influence in a country with so vigorous a technology as the U.S.A.

Sulphuric Acid

THE statistics of production and consumption of sulphuric acid and oleum in the quarter ended September 30 issued by the National Sulphuric Acid Association, Ltd., which we are enabled to print on page 703 of this issue, are of more than usual interest in view of the existing critical position and the anxiety which is felt as to future supplies. For some months past there has been evidence that available supplies have been inadequate, and the latest figures to hand confirm that consumption by essential industries continues to increase at an almost alarming rate, while production of chamber and contact acid is less than in the June and March quarters and not much in advance of the tonnage in the September quarter of 1949. Consumption for agricultural purposes is, of course, seasonal, and may be expected to show a comparatively large figure in the September quarter against practically nil in the three-monthly periods ending June and March respectively, but the fair comparison with the September quarter of 1949 reveals an increase of over 35 per cent—from 8695 tons to 11,800 tons. Consequently, stocks of sulphuric acid and oleum at September 30 were at what appears to be the dangerously low figure of 60,839 tons compared with 67,125 tons a year ago.

Education and Technology

"THE position of Great Britain as a leading industrial nation is being endangered by failure to secure the fullest possible application of science to industry," stated the Percy report in 1945. Three years later the National Advisory Council on Education for Industry and Commerce was set up under the chairmanship of Lt.-Gen. Sir Ronald M. Weeks. Since then there have been numerous reports from various bodies and associations, special conferences and considerable airing of divergent views which have aroused national interest in Parliament and the Press. The first report of the council published this week (HMSO 1s.) is therefore a matter of some import. Its main recommendations are the establishment or development of courses of a high standard in technology, the creation of new awards of degree standard and the setting up of a Royal College of Technologists. Training of technologists is at present the concern of both the universities and the techical colleges, the latter dealing more with students direct from industry. The council agree that the universities' work should be more closely related to fundamental science than that of the technical colleges. Despite present difficulties the technical colleges already make a considerable contribution. In 1948 over 7000 students were taking full-time courses of degree standard and a further 9784 taking part-time courses. Nevertheless, the report emphasises that despite a desire to improve teaching and research and also to develop social and cultural activities, serious overcrowding and limited space have limited such progress. It is essential that this limitation due to inadequate premises should be speedily removed. In a foreword to the report the Minister of Education (Mr. George Tomlinson) states that before taking any decision he will welcome any comments on the report. It is to be hoped, however, that the council's recommendations may prove acceptable and may be implemented without too long delay, so that both colleges and industry may benefit as soon as possible.

INCREASING SULPHURIC ACID TOTALS

Higher Production and Consumption Than a Year Ago

TOTAL production of chamber and contact sulphuric acid and oleum in the quarter ended September 30—442,968 tons—showed a slight decrease compared with the figure for the previous quarter (461,025), but was 40,042 tons more than the corresponding quarter of last year. Consumption showed a similar trend, with 445,312 tons in the September quarter, 464,203 tons in the April-June quarter, and 399,850 tons in the quarter ending September 1949. These figures and the following table are extracted from statistics supplied by the National Sulphuric Association, Ltd.

An increase in the maximum prices of weak sulphuric acid (BOV) by 3s. a ton and strong sulphuric acid (ROV) by 9s. 6d. a ton has been agreed to by the Board of Trade. These increases came into operation on November 13.

PRODUCTION OF SULPHURIC ACID AND OLEUM
(Tons of 100% H_2SO_4)

	Chamber only	Contact only	Chamber and Contact
Stock, July 1, 1950	27,733	30,712	58,445
Production ...	153,279	289,689	442,968
Receipts ...	43,366	12,764	56,130
Oleum Feed	—	2,206	2,206
Adjustments ...	−132	−279	−411
Use	85,981	120,849	206,830
Despatches	110,020	181,649	291,669
Stock, Sept. 30, 1950	28,245	32,594	60,839
Total capacity represented	198,050	306,760	504,810
Percentage production	77 4%	94.4%	87 7%

CONSUMPTION—UNITED KINGDOM

(Tons of 100% H_2SO_4)

Trade Uses	
Accumulators	2,314
Agricultural purposes	11,800
Bichromate and chromic acid .	3,234
Bromine	2,916
Clays (fuller's earth, etc) . . .	2,861
Copper pickling	579
Dealers	5,727
Drugs and fine chemicals	2,975
Dyestuffs and intermediates	20,665
Explosives	4,994
Export	831
Glue, gelatine and size	115
Hydrochloric acid	16,295
Hydrofluoric acid	2,428
Iron pickling (incl. tin plate)	22,839
Leather	1,813
Metal extraction	502
Oil refining and petroleum products	15,062
Oil (vegetable)	2,190
Paint and lithopone	34,075
Paper, etc.	915
Phosphates (industrial)	1,027
Plastics, not otherwise classified	4,511
Rayon and transparent paper	57,798
Sewage	3,009
Soap and glycerin	3,513
Sugar refining	141
Sulphate of ammonia	59,554
Sulphates of copper, nickel, etc.	5,581
Sulphate of magnesium	1,433
Superphosphates	102,294
Tar and benzol	4,622
Textile uses	5,851
Unclassified [including borax and boracic acid; chlorsulphonic acid; formic acid; oxalic, tartaric and citric acids; phenol (synthetic); rare earths; sulphate of alumina; sulphate of barium; sulphate of zinc]	
Total	

RAW MATERIALS
(Tons)

	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock, July 1950	66,879	185.257	78,661	25,409	835
Receipts	45,607	56,927	75,011	65,841	42,811
Adjustments	−11	+12	+148	—	
Use ...	45,389	47,098	91,497	43,868	43,576
Despatches	519	5,747	15	15	
	1*	271*			
Stock, Sept 1950	66,566	189,080	62,308	47,367	

* Used at works for purposes other than sulphuric acid manufacture.

Welding Plant for Australasia

THE board of Murex, Ltd., Rainham, Essex, has collaborated with Australian associates in the formation of a new company Murex (Australasia) Pty., Ltd., whose primary purpose will be to manufacture and sell Murex arc welding electrodes and equipment. It will employ the advanced electrode manufacturing plant and techniques developed by Murex Welding Processes at Waltham Cross. The full resources of the extensive Murex research organisation in England will be at the new company's disposal. Its head office, modern factory and research department will be at Derwent Park, Hobart, Tasmania, and branch offices will be established in all Australian State capitals and later in New Zealand.

On the board of directors of the Australian company are Mr. Francis H. Foster, Mr. C. P. Flockart and Mr. D. E. Hopkins. The general manager is Mr. Wilfred T. Bennett.

Mr. E. J. Clarke, director and development engineer to Murex Welding Processes, Ltd., is already in Tasmania to advise on the installation of plant.

MORE BASIC CHEMICALS USED

Production Also Higher in Some Cases

CONSUMPTION of many basic chemicals and non-ferrous metals in August was higher than in the same month of 1949. An outstanding example is tin, of which consumption was nearly three times as large as it was a year ago, 5160 tons against 1900 tons. Other increases (in thousands of tons) were: Sulphur 30.5 (25.5); molasses for distilling (cane and beet) 42.3 (29.4); industrial alcohol (mil. bulk gal.) 2.94 (2.26); virgin aluminium 15.2 (13.8); virgin zinc 17.3 (15.8); zinc concentrates 14.5 (10.8); natural rubber 4.52 (3.40).

Higher production of several basic materials was recorded. It included an increase in the yield of sulphuric acid to (in thousands of tons) 147.3 (131.1); molasses (cane and beet) 10.5 (7.8); virgin zinc 5.13 (4.70). Exceptions were superphosphate and compound fertilisers, which were slightly down in both production and consumption.

Estimated numbers employed in all sections of the chemical and allied trades in August again showed a slight increase over the totals for the previous month, 449,100 (446,100). Distribution of workers (in thousands), compared with July, was: Coke ovens, chemicals and dyes, explosives and fireworks 258.8 (257.7); pharmaceutical, toilet preparations, etc., 84.0 (83.2); paint and varnish 39.0 (38.8); oils, greases, glue, etc., 67.3 (66.9).

These figures are part of the current issue of the *Monthly Digest of Statistics*, No. 58, October. (H.M.S.O., 2s. 6d.)

	August, 1950 Thousand Tons			August, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	147.3	148.0*		131.1	126.0*	—
Sulphur		30.5	80.2	—	25.5	105.8
Pyrites		16.1	69.5	—	16.1	72.1
Spent oxide		15.8	188.6	—	15.7	173.3
Molasses (cane and beet) ...	10.5	42.3†	181.7	7.8	29.4†	251.2
Industrial alcohol (mil. bulk gal.)	2.74	2.94	0.52	2.13	2.26	4.26
Ammonia		6.83	10.46	—	6.45	6.49
Superphosphate	15 9	13 5		16.0	13.9	—
Compound fertilisers	138.1	78 9		138.4	112.5	—
Liming materials		403.0		—	429.0	—
Nitrogen content of nitrogenous fertilisers	21.57	19.69		21.52	19.16	—
Phosphate rock		75.5	354.3	-	82.9	245.7
Virgin aluminium	2.35	15.2	—	2.57	13.8	—
Virgin copper	—	25.7	126.1	-	28.1	149.9
Virgin zinc	5.13	17.3	54.7	4.70	15.8	75.7
Refined lead	4.81	13.5	81 3	1.86	15.3	65.2
Tin	2.50*	5.16	-	2.28*	1.90	—
Zinc concentrates	—	14.5	78.0	--	10.8	46.5
Magnesium	0.25	0.29	—	0.28	0.31	—
Pig iron	177.0‡	124.0‡	606.0	182.0‡	132.0‡	494.0
Steel ingots and castings (including alloys)	279.0‡	—	1,187.0	288.0‡	—	1,320.0
Rubber: Reclaimed	0.59	0.58	2.55	0 41	0 43	2.98
Natural (including latex) ...	—	4.52	36.1	—	3 40	42.8
Synthetic	—	0.05	0.97	—	0 07	1.59

* July. † Distilling only. ‡ Average of five weeks.

Potash in North Yorkshire

HIGHLY satisfactory results from the potash finds in North-east Yorkshire were reported by the chairman of Fisons, Ltd., in the annual report. Examination of the cores showed the presence of a zone containing potassium chloride extending for over 30 ft. with a 7 ft. thick seam averaging 28 per cent of potash at 3455 ft. Of this a 12 in. thick band was pure potassium chloride and gauged by Continental standards might well be regarded as a remarkable find.

New Standard Tests for Latex

A NEW standard for methods of testing rubber latex (B.S. 1672:1950) has just been issued by the British Standards Institution. This standard is a revision of part of B.S. 902 and includes fresh information on sampling, determination of total dissolved solids, dry rubber content and alkalinity. Its issue recognises the importance of recent advances in latex technology and has accordingly been made in advance of that of the rest of the original standard.

NOBEL PRIZE AWARDS

Chemical Synthesis Discovery

THE Nobel Chemistry Prize for 1950 has been jointly awarded to Emeritus Professor Otto Diels, aged 74, of Kiel University, and his former assistant Professor Kurt Alder, aged 48, who is now at Cologne University where he is director of the Chemical Institute.

The chemistry award was made for the discovery and development of the dien synthesis, which made possible the combination of previously unreactive substances. The synthesis is said to have proved itself superior in many fields in significance and usefulness to all other artificial production methods in organic chemistry. The Diels-Alder reaction is widely used in the production of dyes, chemical drugs, and plastics, and is claimed to have greaty benefited the chemical industry.

Prize for Nuclear Physicist

A British nuclear physicist, Professor Cecil F. Powell, was honoured with the prize for physics. The professor, who is 46, is Melville Wills Professor of Physics at Bristol University, and head of a university research team in nuclear physics and cosmic radiation. He was a research student under Lord Rutherford, and last year was awarded the medal of the Royal Society.

Professor Powell discovered the meson and established the fact that there were two mesons—the μ-meson and the π-meson—which confirmed the calculations of the Japanese physicist Hideki Yukawa who received the Nobel prize in 1949.

The award this year is for Professor Powell's work on the development of the photographic method for the study of nuclear processes.

The Nobel Prize for Literature 1950 was awarded to Earl Russell, O.M., for his "versatile and important writings in which he has shown himself an apostle of humanity and freedom of thought." Philosopher, mathematician, and scientist, Lord Russell, aged 78, was selected last year to give the first of the series of Reith lectures on the BBC. Among his best-known works is the "History of Western Philosophy."

The prizes, which are each worth more than £11,000 which can be drawn by the winners in their own currency, will be handed over at the Nobel Jubilee Festival in Stockholm on December 10.

NEW SYNTHETIC FIBRE

I.C.I. to Produce Terylene

I.C.I., Ltd., is to build at Wilton, North Yorkshire, a plant for the manufacture of the new textile fibre, Terylene. Terylene, says an I.C.I. statement, has reeently been undergoing intensive development in the group's laboratories and also in the U.S.A., where it is known as Fibre V. It is, however, the product of exclusively British research, and the news that Britain is to start production on a commercial scale will be welcomed throughout the textile industry.

11 Million lb. a Year

The new plant will produce Terylene at the rate of 11 million lb. per year, and will be designed to permit rapid extension when that becomes necessary. Raw materials will be obtained from the oil-cracking plant which I.C.I. has now almost completed on the same site and the fibre will be manufactured both as continuous filament and as staple fibre.

A pilot plant with a capacity of several hundred tons per annum has been erected in Lancashire and this plant, in addition to providing technical data for the design of the large-scale plant, is producing material for development work by leading firms in the textile industry.

Terylene is chemically different from any other synthetic fibre. It was discovered in 1940 in the laboratories of the Calico Printers' Association by two chemists, Whinfield and Dickson, who are both now employed by I.C.I. The CPA has made over to I.C.I. the manufacturing rights for the whole world outside the U.S.A. and I.C.I. has been developing the fibre in the laboratories of its plastics division at Welwyn Garden City.

Little Stretch

The synthetic is said to be more than twice as strong as cotton and stretches very little. Its resistance to weathering is good, and it is little affected by most acids. The fabrics it provides can be set by heat to make them unshrinkable and are not affected by moths. Dyeing the fibre has presented some problems, which are now being overcome.

I.C.I. states that the textile properties of Terylene fabrics are remarkably good. It has many of the attractive characteristics of silk and of wool and special attributes, such as crease-resistance and easy laundering, which are not common to natural fabrics.

CHEMISTRY IN THE MODERN COMMUNITY

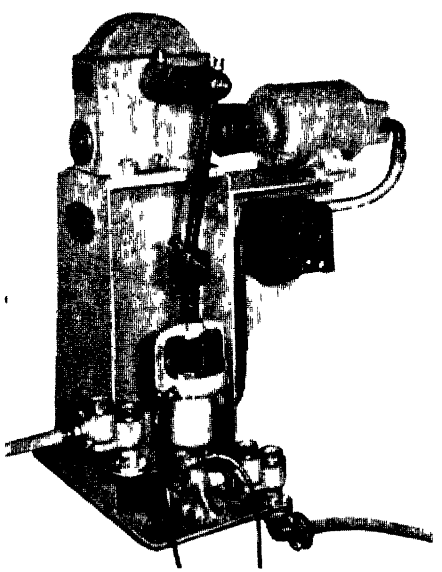
Public Works and Municipal Services Exhibition

THE importance of chemistry to the general needs of the community in modern civilisation was well demonstrated in the Public Works and Municipal Services Congress and Exhibition held at Olympia, London, this week.

These two events—previously held in alternate years—reflect the wide and varied range of local government activity.

Developments in the water treatment field include the new amperometric chlorine residual recorder shown by WALLACE & TIERNAN, LTD. (Stand No. 128). The design is based on the principle that variation of the chlorine content of water will produce changes in the flow of electric current through a cell, and these changes utilised to control an indicating and recording mechanism.

Another instrument shown by this firm was the W. & T. hydraulic solution feeder —designed for accurately dispensing solutions of any water-soluble substances such as sodium carbonate, sodium hydroxide, aluminium sulphate, sodium aluminate, phosphates, soluble silicates and dilute acids. It can be operated manually as a constant feed unit, intermittently in relation to other mechanical operations, automatically to proportion chemical dosage to meet fluctuations in flows or coupled to a visible vacuum solution feed chlorinator when it will work in step with the chlorine flow. Typical applications are pH control of corrosive waters and feeding of precipitants for treatment of sewage and industrial wastes.



[By courtesy of Bell Bros., (Manchester 1927), Ltd

Chemical pump, with double check valves for all types of chemicals such as sulphate of alumina, sulphate of ammonia, chalk, soda, etc. Pumps and valves made of suitable materials for dealing with any specific chemical can also be supplied

Equipment for water filtration, softening and sterilisation was shown by BELL BROTHERS (MANCHESTER 1927), LTD. (Stand No. 100). The types of filter on view were the mechanically agitated filter and vertical air scoured and gravity models. Another interesting exhibit was a Filter Control Table, equipped with Lockheed Control Gear for the operation of valves on either pressure or gravity filters.

New in the sewage disposal field is the Comminutor displayed by JONES AND ATTWOOD, LTD. (Stand No. 102). This machine, although already established in the U.S.A., is a comparative newcomer here. It combines the functions of screening and disintegration, and thus removes the screening problem from the sewage purification process, with its attendant troubles of high maintenance costs, unsightly screening dumps, and the disposal of screenings.

Sampling Machine

Another new appliance of value to works chemists, the first of its kind, is a machine for taking samples of sewage at regular intervals day and night. This was exhibited by HARTLEYS (STOKE-ON-TRENT), LTD. (Stand No. 6).

Recorders of both mechanical and electrical transmission types for the measurement of flows and levels and for recording measurements of sewage and trade effluents were displayed by THE LEA RECORDER CO., LTD. (Stand No. 10), while a demonstration of high grade protective treatments for steel pipes comprising especially bituminous internal and external protections was displayed by STEWARTS & LLOYDS, LTD. (Stand No. 99). This firm also showed a section of 12¾ in. by

in. thick line pipe in grade B steel, sheathed and wrapped externally. Forty-two miles of this line pipe were supplied for the transportation of crude oil from the Firth of Clyde to the new refinery at Grangemouth.

The X-ray diffraction method in the study of industrial dusts with a diagrammatic model showing how the films were obtained formed the principal item of the National Physical Laboratory exhibit on the stand of THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH (Stand No. 124). Another interesting display was the mobile laboratory shown by the materials and construction division of the Road Research Laboratory.

Control of Pests

Gammexane insecticides in the form of dusts, smokes, sprays and concentrates for the control of all the important insect pests were specially featured by IMPERIAL CHEMICAL INDUSTRIES, LTD. (Stand No. 22). A new emulsion concentrate 20 per cent gamma BC can be diluted in water for use as a non-inflammable spray which leaves no residual odour or unsightly deposit.

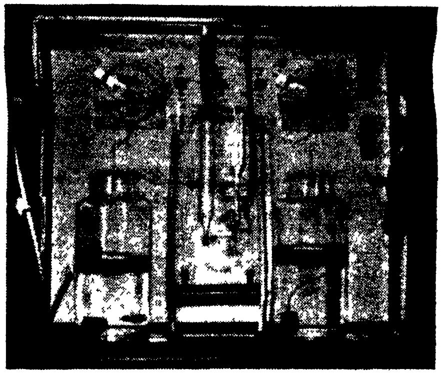
The use of gas in the laboratory formed an important section of the display by THE GAS COUNCIL (Stand No. 110). One item was a gas-fired muffle furnace suitable for operation at all temperatures up to and including 1000° C. It may be used for testing materials at various temperatures, assaying, metal and heat treatments, enamel work, pottery and glass firing, and analytical work. Rapid heating from cold is obtained and gas consumption is low. A pyrometer may be added. Another exhibit was a high speed steel hardening furnace for heat treatment of carbon and high speed steels in the tool room.

Rubber powder and its use in road construction, methods of operation and application were displayed by the BRITISH RUBBER DEVELOPMENT BOARD (Stand No. 229).

Drums for Packaging

Packaging problems whether for the home market or overseas were specially dealt with by METAL CONTAINERS, LTD. (Stand No. 210). A representative display showed the firms products from a small 2-gallon super keg to a 50-gallon capacity drum.

Aluminium sulphate in modern water purification, treatment of sewage and trade effluents were exhibited by PETER SPENCE & SONS, LTD. (Stand No. 249).



[By courtesy of Wallace and Tiernan, Ltd

Close up view of the glass-fronted case which houses the mechanism of the amperometric recorder which measures free or total chlorine residuals differentially upon the operation of a simple tumbler switch

Aluminoferric (aluminium sulphate with a trace of iron sulphate) forms an aluminium hydroxide precipitate. This is highly adsorptive and removes particulate matter from water in two ways. First electrostatically by the positive charge of the aluminium hydroxide neutralising the negative charge carried by colloidal and semi-colloidal organic material including bacteria. Secondly, mechanically by the flocs of alumina precipitate enmeshing particulate material, which settles with the floc.

Instructional Films

Scientific methods of pest control and periodic displays of films were shown by the Infestation Control Division of the MINISTRY OF AGRICULTURE AND FISHERIES (Stand Nos. 161 and 162). The division makes recommendations for the control of infestations by the application of fumigants, sprays, dusts and smokes.

A half-scale working model of a dust recovery filtration plant for removing dust contamination from the air conditioning efflux from factories, power houses, etc., and the recovery of valuable process materials was demonstrated by VOKES, LTD. (Stand No. 186). Micro-Vee panels were also shown for dry filtration and Five-Ply panels were on view both for dry and in oil-wetted form as used in stationary power plants.

The useful work of the BRITISH STANDARDS INSTITUTE, together with a number of its pamphlets, handbooks and publications on chemical engineering, metallurgy, etc., was demonstrated on Stand No. 80.

DE-WATERING OF SLUDGE

The Effects of Freezing With Added Chemicals

by G. S. CLEMENTS, A.R.C.S., F.R.I.C., R. J. STEPHENSON, M.Sc., Ph.D., A.R.I.C., and C. J. REGAN, B.Sc., F.R.I.C.

THE desirability of recovering sewage sludge in a form in which it may be conveniently used is complicated by the problem of rapidly de-watering sludge without use of expensive processes. An investigation of this problem has been carried out by G. S. Clements, R. J. Stephenson and C. J. Regan, of the London County Council. Their findings have been published in a paper, given at the Public Works and Municipal Services Congress, held on November 17, under the auspices of the Institute of Sewage Purification. ("Sludge De-Watering by Freezing With Added Chemicals").

In conducting this investigation the plan followed was to inquire into the types of sludge amenable to treatment, the conditions of freezing, the choice of chemicals, the physical effects observed, and the physical and chemical characteristics of the resultant products.

Rapid Filtration Achieved

The authors say that the finding of answers to these questions required a long series of experiments, at the end of which it was possible to say that a technique had been worked out which permitted the filtration of all types of sewage sludge at rates far higher than any achieved in normal filtering practice.

The effect of freezing was tested on all types of sewage sludge—primary sedimentation sludge, digested sludge, and activated sludge. All these kinds responded to treatment, and were examined with and without the addition of chemicals.

It was found that complete freezing was necessary, even small quantities of unfrozen material having a considerable deleterious effect, especially on filtration. Cooling to freezing point, without actual freezing, produced no significant improvement in settlement or filtration.

A series of experiments was carried out to ascertain the effect of extending the time for freezing. In the preliminary work the sludge was retained in the frozen state for periods of 30 minutes, 1 hour, 1½ hours, and 2 hours, and, with the equipment then available (which permitted only a relatively slow freezing rate), it was found that there was little difference in results with prolonged retention in the frozen state.

At a later stage, however, it became necessary to consider this question from another aspect—that of the actual rate of freezing. This was determined by a set of factors, the most important of which were the freezing temperature, the thickness of the sludge layer frozen, and the time of storage after freezing. These factors became the subject of a special investigation.

Freezing greatly accelerates the settlement of all types of sludge. For one hour's settlement the figure is fairly consistent at about 45 per cent for digested and activated sludges. For primary sedimentation sludge it is not so good and it seems that the large fatty matter content may be responsible. The effect of the addition of chemicals is to produce in the first two types a very rapid initial settlement, although the final one hour's settlement remains at about 45 per cent.

The effect of freezing on the filtrability of sludges is most remarkable. In all cases, sludges after freezing and thawing responded well to vacuum filtration, but the rate of filtration was increased to "unprecedented" levels by the addition, before freezing, of selected chemicals.

It was considered that the action of freezing in promoting settlement might be due to the abstraction of water as ice, with a consequent concentration of the electrolytes dissolved in the interstitial liquor of the sludge. There was a possibility that this action might facilitate precipitation of colloidal material.

Addition of Electrolytes

Electrolytes used to test this hypothesis included common salt, sulphuric acid, the salts of tri-valent metals, and gaseous chlorine. Far from being advantageous, the addition of common salt was found to slow down filtration, and for two very high concentrations—1000 and 5000 parts per million—a marked and progressive decrease in the solids content of the filter-cake was noted.

One of the objects of using sulphuric acid was to study the effect of freezing at low *p*H, however, even substantial additions produced only a small effect on settlement and filtrability.

The most striking results were produced by the use of salts of the trivalent metals,

iron being used in the form of chlorinated copperas and aluminium as aluminium sulphate.

As good results had been partly obtained with chlorinated copperas, it was thought likely that the result might be due to the oxidising effect of the ferric iron present, especially as the oxygen demand of the sludge liquor had been found to be reduced by the treatment. This raised the question of using other oxidising agents, and experiments were undertaken on the use of chlorine in conjunction with freezing.

Chlorine was tried, quite ineffectively, in the form of sodium hypochlorite, but there was an appreciable result by the addition of chlorine water. An increased chlorine dosage was obtained by the addition of chlorine hydrate, produced by passing chlorine gas through a mixture of water and ice. The improvement from such relatively high, but still economically feasible, doses of chlorine was encouraging, although the rate of filtration was a good deal lower than that obtained by the use of salts of iron or aluminium.

A possible explanation of the action of chlorine is that it combines with the iron compounds always present in sludge, and that these compounds effect the precipitation on freezing.

It was established that chemicals must be added before freezing, and preferably after the sludge has been cooled, but before any part of it is frozen. The addition of chemicals after freezing and thawing leads to a much slower rate of settlement than when the chemicals are added before freezing, and the rate of filtration is greatly reduced. The results obtained in the tests were, in fact, worse than those in which the sludge was frozen without chemicals, the only advantage being the production of an exceptionally clear supernatant.

Minimum Doses Required

The minimum effective doses of chlorine, of chlorinated ferrous sulphate, and aluminium sulphate were investigated. It was found that the threshold value for effective action for chlorine was of the order of 100 to 200. Of the tri-valent metals, 100 p.p.m. of ferric iron gave a substantial result, although there was an appreciable effect at 50 p.p.m. Aluminium sulphate in concentrations representing as little as 20 p.p.m. of aluminium gave a significant improvement.

With iron and aluminium compounds, the dosage was increased up to 1000 p.p.m., and the speed of filtration and the quality of the filter-cake improved progressively over this range. The improvement when chlorine was used increased to a maximum, beyond which additional chlorine produced no further effect. This point may coincide with the limit of iron in the sludge, with which the chlorine possibly combines to form ferric iron precipitants.

The supernatants and filtrates have a comparatively low oxygen demand of the order of three times or less that of an untreated sewage.

The filter-cakes obtained on filtering the thawed sludges after freezing with chemicals were distinguished by the rapidity with which they were produced, their high solids content (23 per cent to 30 per cent), the ease with which they could be detached from the filter-cloth, and by their porous and friable texture. The times of filtration, with moderately large doses of chemicals, were of the order of seconds, and the rate of production by vacuum filtration, was, in terms of dry solids produced, as high as 350 lb. per hour per sq. ft. of filtering surface for digested sludges, and up to 70 lb. for activated sludges.

After thawing, all the samples were settled in 1-litre cylinders, and, after the rates of settlement had been noted, were decanted to half-volume and vacuum-filtered on a laboratory Buchner funnel.

Defects of Mechanical Stirring

The results indicated that thawing at slightly more than the ordinary temperature, and thawing with steam both gave good results for settlement and filtration. Mechanical stirring, however, led to serious defects. The filtration period was increased by six to twelve times that of the unstirred samples, although, probably by reason of the disentrainment of carbon dioxide from the sludge, the settlement was better in the stirred sample.

Determinations of the oxygen absorbed from $KMnO_4$ in four hours indicated that the supernatant liquor from the stirred sample was considerably worse than that from the unstirred sample. This adverse effect appears to occur only when the agitation is quite vigorous, and the results emphasise the importance of avoiding pumping after thawing has taken place.

In the projected Northern Outfall Works pilot installation, therefore, provision is to be made for the sludge to be fed by gravity from the thawing compartment to the filter. It is proposed at first to use a small experimental Dorr-Oliver filter, with a drum 1 ft. long and 1 ft. in diameter, and with filtering area of 3.1 sq. ft. The separation of solid and liquid on thawing is so definite, and the solid so dense and particulate, that it is unlikely

that it will be picked up on the filter cloth by the rotation of the drum in a trough. An alternative means will have to be devised for running the sludge directly on to the filtering surface. The highest capacity for filters of this type is estimated by the manufacturers to be 100 lb./hr./ft.^{2} of dry solids.

In these present experiments at the Northern Outfall Works, outputs of the order of 350-lb./hr./ft.^{2}. were obtained, and it appears certain that if on a practical scale quantities like this were desired, very considerable modification of existing type of filter would be necessary. The possibility of using other and possibly simpler methods of filtration has, of course, not been overlooked.

The investigation has at present only covered a preliminary stage, and it is impossible to give any definite estimate of the cost such a process would involve. It is, of course, impossible to give even a rough idea of the capital expenditure which would be necessary for plant. On the running cost side, figures can only be put forward on an extremely tentative basis. These show, however, that the cost involved would not be out of all reason.

The power required to produce a ton of ice at the large plant at Grimsby is 26 kWh, and it is reasonable to assume that by making use of the thawing ice to cool the refrigerant a saving of at least 25 per cent of the power could be effected, leaving a figure of 19.5 kWh per ton. It is difficult to obtain an exact figure for the cost of electric power at a high load factor as it is likely that a reduced charge could be made, but the figure would be of the order of one penny per kWh. This would enable a ton of sludge to be frozen for 1s. 7½d.

The cost of chemicals to treat a digested sludge, of say 5 per cent dry solids, so that it could be filtered at the rate of 40-50 lb. dry solids per sq. ft. per hour is comparatively small. It works out at about 5d. per ton of wet sludge, whether chlorine, chlorinated ferrous sulphate or aluminoferric are used. This is due to the fact that the efficiency of the chemicals increases with their cost. The total running cost of this part of the treatment would, therefore, be of the order of 2s. per ton of wet sludge.

No experiments with a filter drum have yet been carried out and so no information is at present available as to the cost of filtration at these high rates.

Research Expanded Ten Times in Ten Years

THE great expansion of the research programme of Glaxo Laboratories, Ltd., and the intention at least to maintain the work on this scale in the future was evidenced in the review by the chairman (Sir Harry Jephcott) of the year ended June 30.

Expenditure upon research and development had steadily increased and was now more than ten times greater than in 1939, he said. During the year a large extension of the research department at Greenford had more than doubled the laboratory space available. The new research laboratory for work on antibiotic substances and related problems at Sefton Park had been occupied since June.

In addition, development facilities at Ulverston had been increased and further expansion was planned. It was of the nature of research work that success could not be guaranteed; research expenditure must in any event be continued over a period of years if results of value were to be achieved. It was considered wise to make such financial provision as would ensure continuity of this work of research and development and a reserve had now been created for future research and development. Should less favourable times arrive this reserve would be used to maintain work of research and development.

During the year the total sales overseas by the parent company and its subsidiaries had increased by over 30 per cent.

The company's investment overseas continued to grow and it would be necessary to increase it as further development of certain of the overseas subsidiary companies became desirable. While most of the company's overseas and export business was within the sterling area, it was especially satisfactory to report that there was now a substantial dollar export business. With the object of further enhancing dollar sales, a Canadian subsidiary company had recently been formed and Mr. J. Hutchinson, who for some time past had been executive sales director in this country, had become resident managing director of Glaxo (Canada), Ltd.

Throughout the year particular attention had been given to increasing the efficiency of all manufacturing processes and thereby the productivity. In this respect the reports of the Anglo-American Productivity Teams had been welcomed. It was believed that further benefit would follow from the continuous development of friendly interchange between American and British industries.

CARBON AND GRAPHITE

*Value of Special Properties to the Chemical Engineer**

by W. S. NORMAN, Ph.D., A.M.I.Chem.E.

CARBON and graphite have many properties of value to the chemical engineer. In the first place they are inert to most chemical reagents with the exception of strongly oxidising compounds such as oleum, chromic acid and nitric acid. In particular it is one of the few materials resistant to aqueous hydrofluoric acid and to phosphoric acid at all temperatures.

The coefficient of thermal expansion is low (about one-third that of steel) and carbon and graphite are highly resistant to thermal shock. In an inert atmosphere graphite is stable at all temperatures up to 3000° C. and its strength remains unimpaired at high temperatures. Carbon is also stable at high temperatures, though of course graphitisation commences at temperatures above 2000° C.

When heated in air, carbon starts to oxidise at about 350° C. and graphite has a critical oxidation temperature of about 450° C. However, in spite of this apparent limitation, carbon is proving satisfactory for lining the hearth and walls of blast furnaces and for many other applications in the metallurgical industries where some degree of oxidation is encountered.

Conductivity Properties

One of the most valuable properties of graphite is its high thermal and electrical conductivity. Fully graphitised carbon has a thermal conductivity of about 75 B.Th.U./ft.^{2} hr. °F. per ft., but it is often preferable to use a material of lower conductivity, in the region of 40 B.Th.U./ft.^{2} hr. °F. per ft., as this grade has better strength and hardness properties.

For comparison, brass has a conductivity of 60 while the value for stainless steel is only 15 in the same units. This property is turned to good account in the use of graphite heat exchangers for corrosive fluids.

Carbon and graphite can be cut and machined to the standard engineering tolerances. In the case of carbon, the tools should be tipped with a hard alloy resistant to abrasion, and for many operations grinding is preferable to machining.

The self-lubricating properties of certain grades of carbon and graphite are of value in many applications, typical examples being brushes for electrical contacts and bearings, glands and sealing rings where no lubricant can be employed. Compressors with cast-iron cylinders and carbon piston rings are used for compressing hydrogen chloride gas and for other purposes where lubricant cannot be used.

Recent investigations indicate that the self-lubricating property of graphite is probably due to the presence of a very strongly adsorbed film of moisture. Experience with electric motors and dynamos in aircraft has shown that under the very dry conditions encountered at high altitudes the graphite brushes become abrasive, causing rapid wear, and it is thought that this occurs due to the failure of the lubricating film of water.

Impermeability

A certain degree of porosity is inherent in all carbon products, and while the permeability may be reduced by decreasing the pore size it has not so far been possible to achieve complete impermeability in this way.

The porosity and permeability can be decreased by impregnating with a material such as pitch and carbonising, but this treatment does not confer complete impermeability since new pores are created during the carbonising.

It has been stated that the carbon directing vanes used on the German V-2 rockets were given 14 successive impregnation and firing treatments to enable them to withstand the action of the blast of hot gas from the rocket motor.

For most chemical engineering applications, carbon and graphite are rendered impermeable by impregnation with a liquid resin which is then polymerised, usually by heat treatment. Impregnated carbons have practically the same corrosion resistance as the parent carbon, but they cannot be used at temperatures above the decomposition point of the resin, usually about 160-168° C.

Synthetic resins are satisfactory for cementing carbon to carbon or to stoneware, metal, glass, etc. Several proprietary cements are available for use in the erection of carbon equipment or for cementing carbon tiles or liners in vessels.

In the design and construction of carbon equipment, due allowance should be made

* Abstract of an article by the Birmingham University lecturer in chemical engineering in the *Birmingham University Chemical Engineer* (2, (1), 14-21.)

for the fact that carbon is a brittle material and liable to fracture if exposed to mechanical shock. Unsupported lengths of carbon or graphite pipe may be broken by accidental damage, water hammer or excessive vibration, and it is good policy to provide the highest possible degree of protection.

A further feature of carbon is that its compressive strength is about five times as high as its strength under tension, and it is therefore an advantage if the carbon is subjected to compressive stress and any tensile load taken up by metal reinforcement. This technique is standard practice in other fields, such as the construction of reinforced concrete, but it is not always realised that carbon requires similar treatment.

Graphite Heat Exchanger

An example of what can be done in this way is the Powell Duffryn Research Laboratories' heat exchanger formed of a block of graphite perforated by rows of passages for the two fluids. The graphite is maintained under compression by two heavy cast-iron clamping plates at top and bottom, and the carbon headers are also held in position by backing plates of heavy section to ensure that no distortion takes place under load. The bolt tension is adjusted so that the pressure of the fluid in the block and headers is neutralised and the carbon is subjected only to compressive loads.

It is impossible in a short paper to review all the applications of carbon and graphite in the chemical industry, but the following list affords some typical examples:—

- Pumps, valves and pipes for corrosive fluids.
- Furnace tubes, retorts and linings.
- Electrodes for electrolytic cells and electric furnaces.
- Ejectors for corrosive fluids.
- Pistons and piston rings.
- Linings for reaction vessels, pickling tanks, sulphite pulp digesters, storage tanks, absorption towers. etc.
- Packings for absorption and distillation columns.
- Heat exchangers, evaporators, boilers, condensers.

For certain applications, the particular properties of carbon or graphite make them an obvious choice, but it is more usual to have several possible materials such as carbon, glass, stoneware, and for duties which do not call for high temperatures, rubber compositions and the synthetic resins may also be considered.

The choice will be determined ultimately on economic grounds, and the following general considerations may be of assistance. Weight for weight, carbon is usually more expensive than glass or stoneware, but to some extent this is offset by the ease with which it can be fabricated and assembled, thus reducing erection costs.

Corrosion resistance and the working life are most important factors since they determine not only the cost of maintaining or renewing the equipment but also the loss of production time during overhauls.

Unfortunately accelerated corrosion tests are not always reliable since failure often occurs through other causes such as thermal shock, abrasion or surface cracking. The problem is so complex that plant experience over a period of years is the only reliable guide.

For heat transfer purposes, graphite stands supreme among the non-metallic materials. Apart from its corrosion-resistance it has the advantage that it will not cause contamination of solutions. For this reason it is finding application in the manufacture of fine chemicals, foodstuffs and fruit juices, where corrosion is not very severe but freedom from contamination is most important.

Estimation of Lead Oxide

AMONG papers presented and discussed at a meeting of the Chemical Society at Burlington House on November 1 was "The Determination of the Lead Oxide in the Presence of Lead," by R. M. Black, M.Sc., A.R.I.C.

The method described the estimation of lead and lead oxide in lead dross by means of the reaction between lead monoxide and an ammonium salt to give ammonia and the corresponding lead salt. The ammonia is removed from the solution by steam distillation, absorbed in an excess of boric acid and the ammonium borate so formed titrated with standard acid in the usual manner.

The method was stated to give reasonable accuracy with quantities of lead oxide as small as 10 mg., but further development is required before it becomes applicable to small oxide inclusions in lead sheathing alloys.

Two other papers discussed at the meeting were "The Determination of Sodium in Aluminium and its Alloys by Vacuum Distillation," by W. McCamley, B.Sc., T. F. L. Scott and R. Smart, B.Sc., A.R.I.C., and "Chemical Determination of Magnesium in Cast Iron," by W. Westwood, B.Sc., A.I.M., and R. Presser.

DEVELOPING BENZOL TECHNOLOGY

Investigations of Catalytic Processes

THE rapidly increasing demand for the aromatic hydrocarbons present in benzene as the starting point for the manufacture of styrene, synthetic phenol, plastics and explosives is one of the salient features of a review of the benzol industry in 1948, by H. E. Newall, D.Sc., Ph.D., A.R.I.C. of the Fuel Research Station, DSIR.

In the United States the demand for benzene in the chemical industry is outstripping supply and the carbonising industries can no longer meet all demands for aromatic hydrocarbons. The petroleum industry will in future play an increasingly important role in the production of these hydrocarbons. Although peace-time requirements of toluene for the manufacture of explosives can be satisfied by recovery from benzol, the large wartime demand had to be met partly by production from petroleum fractions. Because of the increasing demand for xylenes, the separation of these hydrocarbons from petroleum oils is now being carried out and the production of benzene from cracking processes may be an economic proposition.

In Britain there is a much smaller demand for benzol as a source of chemicals than in the United States, but its recovery from coal gas on the maximum scale, for use as motor fuel, is of great importance. In 1947, the total crude benzol production was 78.1 million gal., of which 58.6 million gal. were obtained by gas scrubbing at coke-oven plants, 15.4 million gal. at gas works, and 4.1 million gal. by tar distillation. The annual production in 1948 was about 93 million gal.

Reducing Sludge Formation

In 1948 considerable attention was given to the removal of sulphur compounds from coal gas. Although these investigations were not concerned primarily with benzol recovery, they have an important bearing on this subject, from the point of view both of reducing sludge formation and therefore promoting better washing efficiency and of effecting economies in benzol refining.

The purification of gas from hydrogen sulphide by means of iron oxide has several disadvantages under present-day conditions. The initial cost of the boxes is high, the area occupied by the plant is large, and the labour required for charging and discharging the boxes is costly. A reduction of labour costs and of ground space is being achieved at a number of works by the use of tower purifiers instead of the normal oxide boxes.

The preparation of iron oxide of greater activity is receiving attention here and overseas, but such material has not yet been used on a large scale.

In France, the scarcity of both natural and residual iron oxide led L. Fassina to investigate the efficiency of mixtures of manganese and iron hydroxides. The amounts of manganese and iron for optimum efficiency were determined and when these materials were mixed with sawdust a very active purifying agent was obtained. A considerable saving in labour and in ground space was thus effected.

Gas Purification

Some progress in the alternative method of gas purification has been made. It is claimed that the Manchester liquid purification process, which operates on a scale of 2 million cu. ft. of gas daily, effects purification to the Gas Referee's standards. The capital cost of liquid purification plant is stated to be only 60 per cent of that of the dry box system, and there is the further advantage that the plant requires a smaller area.

The Liverpool Gas Co. is installing a plant based on the Manchester process, capable of treating 4 to 5 million cu. ft. of gas per day, which will be used to study behaviour with the various types of gas occurring in the carbonising industry.

Plant and Newling have reported on the latest work carried out by the Gas Light and Coke Co. on the catalytic removal of organic sulphur compounds from coal gas. The nickel sulphide catalyst operates at a temperature of about 360° C. and requires regeneration after 90 to 120 days. The limit to which the organic sulphur content, other than thiophene, can be reduced is still about 3 gr. per 100 cu. ft. If the process is worked on stripped gas, a somewhat longer catalyst life and lower working costs may be expected.

Further improvements in the catalytic method developed by the Gas Research Board have been patented. A disadvantage of the earlier process was the necessity to remove hydrogen sulphide from the

These abstracts from "Benzole in 1948" are published by permission of the DSIR.

gas before treatment. The improved process first subjects the gas at 250 to 350° C. to the action of a hydrogenating catalyst, such as molybdenum sulphide. Then, in the presence of steam amounting to at least 10 per cent of the volume of the mixture, the gas is allowed to react with an oxide or sulphide of chromium catalyst carried on active carbon or activated alumina.

In discussing papers relating to the wash oil process for benzol recovery, Dr. Newall refers to the investigations of the Benzol Technical Committee of the Ministry of Fuel and Power on sludging and corrosion in benzol-absorption plants. These investigations showed that sludge formation was probably due mainly to the oxidation of unsaturated compounds, such as indene, removed from the gas, although there was evidence that elemental sulphur might play a similar role. The investigation of the reactions of oxygen with indene and the nature of the products obtained was continued after the committee had completed its work, and an account given by Newall, Ackroyd and Cawley.

German Methods

It has been reported that German benzol-recovery plants are similar to those used in Britain. Benzol absorption is generally carried out by the use of creosote oil in standard tower scrubbers. Wash oil regeneration is not normally practised, no plant of the Clayton cascade type familiar in Britain being found. At some plants where gas is raised to a pressure of 8 to 20 atm. for introductioh to the gas grid, benzol scrubbing is carried out on the high pressure gas. Benzol recovery in these conditions is interesting chiefly on account of the increased concentration of benzol which is possible in the wash oil, 5 per cent being a normal figure.

The sulphuric acid process, despite its disadvantages, was the one most extensively used by the benzol-refining industry in Germany. The Ufer and Instill processes were tried at a few installations. Vapour-phase treatment with clay for the removal of gum-forming substances from petrols is used in the petroleum industry, but its application to benzol refining appears to be a new development. A plant for the treatment of benzol was operated in Germany and the gum content of the refined product was within the limits specified by the German Benzol Association, though the clay consumption was high.

The catalytic desulphurisation of benzene in the vapour and liquid phases has been studied by Glushnyov and Vasmilyov. The best results were obtained in the vapour phase with phosphoric acid and zinc chloride on activated carbon.

In the section of the review dealing with the analysis of hydrocarbon mixtures, mention is made of a method which has been used extensively for the determination of aromatic and olefinic hydrocarbons in motor spirits and coal tar distillates. This consists of extracting the sample with sulphuric acid, thus dissolving the aromatics and olefines and leaving an insoluble residue of naphthalenes and paraffins.

If fuming sulphuric acid is used complete sulphonation of the unsaturated hydrocarbons usually occurs, but some of the saturated hydrocarbons may also be sulphonated. With less concentrated acid the reaction with saturated hydrocarbons is decreased, but aromatics may be incompletely sulphonated and olefines tend to produce polymers which are not completely dissolved. The use of added catalysts, *e.g.*, silver sulphate, has been proposed.

McKee, Herndon and Withrow carried out an investigation of the isatin test for the estimation of thiophene in motor spirits. In the majority of the determinations the colours were matched by visual observation, but a more precise photoelectric method was also used. The method was also applied to cracked gasolines, but a secondary reaction, which produced a red colour, took place slowly. Various precautions to overcome this difficulty were recommended in the paper.

Phenols in Motor Spirits

Mapstone has reported a colorimetric method for the determination of phenols in motor spirits, based on the formation of blue indiphenol, by treatment of the sample with dilute ammonia and medium strength hypochlorite solution. The method is suitable in plant control work for the determination of up to 1.0 per cent of phenol, with a sensitivity of 0.05 per cent. Mapstone has also described colorimetric tests for distinguishing between phenol and the three cresoles in petrol.

Investigations of benzene poisoning are briefly reviewed. Some recent work of the Massachusetts Division of Occupational Hygiene has been discussed by Hardy and Elkins, who confirm that the concentration of benzene in a workers' environment should not exceed 35 p.p.m. Forssman and Frykols have stated that exposure to benzene creates in workers an increased demand for vitamin C and an extra supply of this vitamin raises their resistance to the effects of benzene. It has also been shown that benzene is not absorbed through the skin.

TRIFLUOROCHLOROETHYLENE

Development of Dispersions for Protective Coatings

by A CORRESPONDENT

MUCH interest has been shown during the last 18 months in the development of dispersions of the new fluorinated hydrocarbon plastics, polytetrafluoroethylene and the polymer of trifluorochloroethylene for the protection of metal, glass and stoneware.

In the U.S.A., PTFE dispersions have been made available for general appraisal work in industry for about a year and the M. W. Kellogg Company, of New Jersey, has now produced the first two of a series of KEL-F, trifluorochloroethylene polymer dispersions.

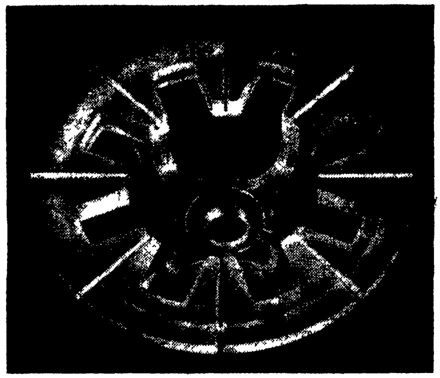
POLYTETRAFLUOROETHYLENE is now being manufactured in Great Britain in the form of granules for fabrication by moulding and extrusion, but so far not as a dispersion. The polymer of trifluorochloroethylene has not yet been produced in this country, although it is likely that eventually this most important addition to the range of fluorinated plastics will be made in Britain. Dispersions of both PTFE (polytetrafluoroethylene) and KEL-F (polymer of trifluorochloroethylene) are important new forms of both these plastics.

These dispersions are non-aqueous, containing approximately 20 and 27 per cent dispersed plastic solids having a particle size of about one micron.

The dispersion medium is usually a hydrocarbon solvent having a flash point above 80°F. The apparent viscosities of the dispersions containing 15 to 30 per cent solids range from 80 to 150 centipoises at room temperature. After the diluent evaporates there is left a white deposit of polymer particles. There are converted into a continuous semi-transparent and extremely tenacious film by fusion at 240-250°C.

The oustanding properties of trifluorochloroethylene polymer dispersions may be conveniently summarised as follows:—

1. The dispersions are remarkably stable and may be heated to 80°C. for seven days, agitated vigorously and kept several weeks at 0°C. without ill effects.
2. Dispersions are suitable for spray, brush and dip coating. If necessary, they can be diluted with xylene.
3. Polymer dispersions possess excellent adhesion to metal, stoneware, glass and other surfaces. For wire coating dispersions are available which possess high adhesion and low creep properties.
4. Film thicknesses of 0.010 in. to 0.015 in. can be built up by repeated dip coating or brushing. When properly fused, such deposits are semi-transparent. For the protection of chemical plant there is no doubt that film thicknesses of the order of 0.010 in. are desirable.



An electronic tube base made from KEL-F

The surface of the metal or glass, etc., is first thoroughly cleaned and dried. The dispersion is then sprayed or brushed on and allowed to dry by evaporation of the solvent. Coatings can be air-dried or heated up to 150°C. prior to the actual fusion operation. Where the dispersion is employed for internal coatings it is recommended that a gentle stream of inert gas (nitrogen) be passed into or through the object so as to carry away all organic vapours before fusion commences.

Fusion, which is the next operation, requires exposure to a temperature of 240-250°C. for 45 to 60 minutes followed by a 5-10 hours' baking at 225-240°C. It is possible to reduce the time considerably by increasing the temperature, but special techniques have then to be adopted. Experience has shown that high gloss and smooth protective films are best procured by long baking at moderate temperatures.

Technical Publications

OF particular interest in chemical engineering industry, in which fine control of process conditions is frequently essential, is the new series of electric proportioning valves and controls by the British Thermostat Co., Ltd., Sunbury-on-Thames, Middlesex, described in technical publication AT/28A. The series (Z.A.), augments the Teddington range of controllers for the automatic regulation of heating, air conditioning and refrigerating processes. Proportioning units adapted for use with fluids and gases are also available to order for special applications.

* * *

DETAILED information about public and industrial fire brigades and salvage corps in the United Kingdom with useful data on the science of fire prevention and extinction is contained in the "Fire Protection and Accident Prevention Year Book, 1951," published by Benn Brothers, Ltd., 154 Fleet Street, London, E.C.4 (10s. 6d. post paid). Particulars of fire brigades in the Commonwealth and Empire and in the U.S.A. and other foreign countries are also included. An additional asset of this edition is the inclusion for the first time of a desk diary.

* * *

THE state of solution of viscose has long been a problem in the chemistry of cellulose and is a matter of considerable importance to the rayon viscose pulp industries. An investigation of the state of solution in exmulsionxanthated viscoses is discussed by Fred Gärtner and Olaf Samuelson in *Svensk Papperstidning* (Vol. 53, No. 20), official organ of the Swedish Paper Mills Association and associated groups.

* * *

ACCURATE measurement of light is often essential for research work. Details of its latest direct reading auto-photometer are given in sheet No. 464, issued by Everett Edgcumbe & Co., Ltd., London. A separate photocell with interconnecting tough rubber flex minimises the risk of interception of light by the operator.

* * *

MOST aspects of the selection, installation and maintenance of air compressors are discussed at length by D. Y. Marshall in the current issue of the *Journal of Incorporated Plant Engineers* (2, 228-282). This illustrated treatise reproduces the paper presented before the Royal Society of Arts in March this year.

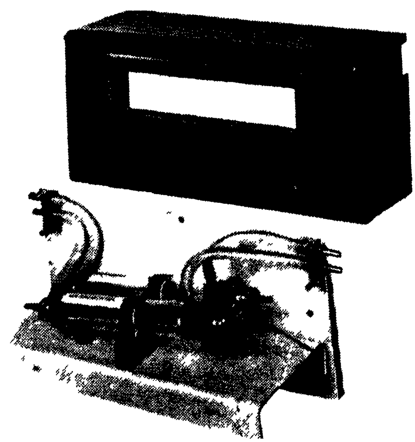
THE four main types of steel-making furnaces—Bessemer, electric arc, high frequency inducting and crucible—are described in "Steel News" (Vol. 2, No. 8) which combines the September and October issues of the journal published by the British Iron and Steel Federation. Under the title "Revolution in Food Production," another article shows the impact of steel supplies on agriculture in the form of implements, etc.

* * *

SINKING an oil well is described in an illustrated article in the current issue of "Rope Talks" (No. 24) published by British Ropes, Ltd.

* * *

DIRECT reading of the ratio of the conductivity of two liquids under continuous flow conditions is the object of a new conductivity meter designed by Edison Swan Electric Co., Ltd. The instrument consists of two units, the larger of which contains all the electronic parts (oscillator, meter, etc.) and the smaller the liquid parts (conductivity cells). This ensures that the electronic parts are not ruined by any possible leakage from the cells.



[By courtesy of Edison Swan Electric Co, Ltd.

The conductivity cells are made of Perspex tubes with monel electrodes which can easily be dismantled for cleaning. The liquid is introduced through unions designed for 3/16 in. bore flexible tubing such as PVC or telecothene

The Chemist's Bookshelf

STEREOCHEMISTRY. E. de Barry Barnett. 1950, London: Sir Isaac Pitman & Sons, Ltd. Pp. ix + 169. 18s.

This is the first textbook on stereochemistry to have been published in English for over 30 years and it should meet a wide demand. Because of its small size, however, it is restricted in scope to a survey of those topics required by students taking an honours degree in chemistry. It does not set out to be a comprehensive treatise on the subject.

The book is conveniently divided into nine arbitrary chapters, the first of which introduces the concept of spatial relationships and the general background to the topic, including a brief historical reference. Chapter 2 deals with external compensation, including the separation of enantiomorphs and racemisation. Chapter 3, which is the longest in the book, discusses atoms having a covalency of up to nine, including the rare examples potassium fluozirconate and potassium fluoniobate, and the unique compound neodymium bromate enneahydrate.

Chapter 4 surveys the properties of the allenes, spiranes *et al*, and discusses the subjects of restricted rotation and "folded rings" under the heading of "General Molecular Dissymmetry." Chapter 5 is primarily concerned with the Walden Inversion and outlines those reactions in which an inactive compound is converted into an optically active one, without a separation of optical isomers.

The ethylenic double bonds and the oximes are the principal items dealt with in chaper 6; reference is also made to nitrogen-nitrogen double bonds. In chapter 7, which is devoted to geometrical isomerism in cyclic systems, an approach to distinguishing between cis and trans isomers is discussed. One of the examples described in detail is hexachlorocyclohexane, the γ isomer of which is Gammexane.

Chapter 8 provides a dissertation on the subject of strain theory and strainless rings, and passing mention is made of recent theory on large strainless rings. Steric hindrance is the subject of chapter 9. To illustrate the extent of hindrance due to substituents a few examples from Victor Meyer's work are given. The book is completed by an appendix in which details for the making of molecular models are described.

This is a book which should be very useful in clearing up many of the difficulties encountered by undergraduates in the study of stereochemistry. Whether the rather high price is within their reach, however, is open to doubt.—P.M.

A GERMAN-ENGLISH DICTIONARY FOR CHEMISTS. Austin M. Patterson. 1950, New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. xviii + 541. 40s.

This is the third edition of the work which last appeared in 1935. It contains about 59,000 references, and while these are predominantly chemical, a number of terms from related fields of science are also included. In addition, a considerable vocabulary of general words has been incorporated so as to make the use of a separate dictionary largely unnecessary. Self-evident words have, however, been excluded. The latest decisions in nomenclature have been followed throughout.

The dictionary, in this new edition, is appreciably bigger than its predecessors and has an improved binding. Despite the effect of re-valuation on the price, it is well worth the money and is highly recommended for easier reading of German scientific literature.—P.M.

Books Received

INORGANIC MICRO-ANALYSIS. H. V. A. Briscoe and P. F. Holt. 1950, London: Edward Arnold & Co. Pp. vii + 171. 12s. 6d.

FORENSIC SCIENCE AND LABORATORY TECHNICS. R. F. Turner. 1949, Illinois: C. C. Thomas. Oxford: Blackwell Scientific Publications, Ltd. Pp. xxv + 240. $6.50.

A MANUAL OF PLASTICS AND RESINS. Edited by W. Schack. 1950, New York: Chemical Publishing Co., Inc. Pp. 547. $10.00.

REVIEWS OF PETROLEUM TECHNOLOGY. Vol. 9, 1947. Edited by F. H. Garner, E. B. Evans and G. Sell. 1950, London: The Institute of Petroleum Pp. 340. 27s. 6d.

OVERSEAS CHEMISTRY AND INDUSTRY

SHORTAGES IN GERMANY

Agitation for Larger Chlorine Production

THE recent increase in demand—following a prolonged period of steadily mounting production—has found many chemical manufacturers in Western Germany unable to take full advantage of the new business available. Allied restrictions on chemical production and plant are chiefly blamed for the present difficulties and delays. There is little doubt, however, that increasing exports, especially of basic chemicals and dyestuffs, and financial impediments to a smooth flow of raw material imports are equally responsible for inconveniences experienced by German producers.

Much of the present business is, in any case, due to purchases for stock replenishment in anticipation of higher prices.

There has been a recent slowing of the expansion of the output of basic commodities, including coal and steel, the effect of which is likely to be felt shortly in the chemical industry.

Lignite as Motor Fuel

Lack of surplus coal has stimulated research into chemical uses of lignite. Though Germany's largest brown coal deposits are in the Soviet zone, there are substantial quantities in the Rhineland. Professor Drave has reported to experts of the German Coal Mining Directorate that lignite gasification by new, highly efficient processes is capable of yielding a gas consisting almost entirely of CO and H_2 suitable for producing motor spirit, diesel oil and solid hydrocarbon compounds, like paraffin wax, as well as alcohols and ammonia.

Gasification of lignite in the presence of an oxygen-steam mixture at pressures of 20-30 atm. yields a town gas of adequate quality in a single working process. According to Professor Drave this gas can be enriched to supply a cheap and satisfactory motor fuel.

The decision of the Allied High Commission to fix an output ceiling of 224,150 tons for chlorine has not been well received. This quantity corresponds to the present output capacity of the 11 existing chlorine-producing plants and is roughly in line with the actual production in Western Germany during 1943. It is argued that the production capacity should be increased by 20-30 per cent and that the Allied authorities should consent to such an expansion, particularly in view of the decision at the last Foreign Ministers' Conference to review existing arrangements concerning banned and restricted industries.

It is pointed out that there are now heavier demands on the electrolytic cells of the salt electrolysis plants than hitherto and this will cause them to wear out more rapidly. The restriction on chlorine will limit output of soda ash and other chemical manufactures which used these two substances as raw materials. It is now often impossible to meet all requirements of such chemicals.

Among producers complaining about the restrictions on chlorine production is Anorgana, Gendorf, the biggest chemical works in Bavaria. This company, formerly part of I. G. Farbenindustrie, also asserts that it cannot fulfil the objectives laid down in the Marshall Plan without allocation of substantially increased financial funds.

The scarcity of non-ferrous metals has been aggravated by shipping difficulties, *e.g.*, for imported pyrites. This causes many fabricators to accept new orders subject only to availability of raw materials. Some manufacturers even stipulate that the buyer must deliver scrap metals equal to the whole or part of the weight of the ordered objects. Under the influence of world high market prices, efforts are being made to increase mining and smelting of local ores, but the additional quantities so obtained are unimportant.

Copper Production

Kurhessischer Kupferschieferbergbau GmbH is now producing about 100 tons of copper a month. The Lippewerk aluminium plant at Luenen, Westphalia, has resumed production at a rate of 10,000-12,000 tons a year and hopes to increase its output slightly by the end of the year, given adequate electric power.

In a new memorandum to the Allied High Commission the Federal Government requested that dismantling operations should be suspended at the Innwerk aluminium plant at Toeging, Bavaria. Production there is said to be at an annual rate of about 30,000 tons and could be

(continued at foot of opposite page)

INDIA PLANS SELF-SUFFICIENCY

Fertiliser Production Plans——U.S. Aids DDT Output

INDIA'S present needs and estimated future requirements of nitrogeous and phosphatic fertilisers, and the plans being made to increase their production in India, were discussed at a recent meeting in New Delhi, between representatives of the Ministry of Agriculture and other Government departments and of the fertiliser manufacturing industry.

Domestic requirements of ammonium sulphate for the next few years were estimated to be between 400,000 and 450,000 tons per annum, and they could be expected to rise to about 600,000 tons a year by 1955-56. The take-up would depend to some extent on the fertilisers being supplied to the cultivators at a reasonable price and on their being educated in the subject of soil fertility.

The need for this was illustrated by the fact that consumption of ammonium sulphate during the last year and a half had only been about 280,000 tons per annum.

Phosphatic Fertilisers

Ammonium sulphate was being manufactured at six units in the country, two of which produced it directly and four as a by-product. The possible output of the private firms manufacturing ammonium sulphate was about 80,000 tons per annum, but actual total production in 1949 had been only 46,000 tons.

Representatives of the industry mentioned that the Mysore and Travancore factories were to be expanded. The Mysore Government also had a scheme for the manufacture of ammonium sulphate at Bhadravati. The Indian Government fertiliser factory at Sindri would shortly be in production and was likely to reach its full output by the end of 1951.

About 14 plants in India were producing phosphatic fertilisers. These had a potential capacity of about 150,000 tons, but the actual production in 1949 had been 46,000 tons. Some improvement had been shown this year, and total output was expected to exceed 50,000 tons.

Domestic requirements of phosphatic fertilisers in the next few years were estimated at about 100,000 tons per annum, but 200,000 tons of superphosphates would be needed by 1955-56, in view of the expected consumption then of 600,000 tons of ammonium sulphate. Plans were in hand for the expansion of existing phosphatic fertiliser manufacturing units; a new factory was to be established in Bihar.

AN appeal to pharmacists in the State of Bombay to give more co-operation and encouragement to research in indigenous drugs was made by Dr. M. D. D. Gilder, Minister of Health, when he inaugurated the recent pharmaceutical conference in Bombay. A number of Indian firms manufactured vitamins A and D from materials available locally, but vitamins B and C were imported in bulk.

A project was being considered by the Government of India and the Government of Bombay for the manufacture of penicillin, sulpha- and the anti-malarial drugs. A suitable site had already been selected for a factory. Meanwhile, penicillin would be imported and bottled in India.

Dollar aid for India to establish a factory for the manufacture of DDT is being discussed by the Government and the headquarters of the UNICEF. It is believed that a contribution of $750,000 may be granted from U.S. sources.

The original request from India was for technical aid in establishing a penicillin factory, but UNICEF considered that the health problems not only of India, but other Far Eastern countries, would be better served by the production of DDT.

Ceylon and Pakistan have put forward similar suggestions for aid. The Indian factory will have to give part of its DDT production to UNICEF for distribution in Far Eastern countries.

SHORTAGES IN GERMANY

(continued from opposite page)

raised to approximately 40,000 tons if dismantling were stopped.

Fluorspar producers in the Palatinate report a substantial improvement, not only in domestic sales, but in exports. The demand from the United States and other non-European countries has greatly increased, so much so that some producers have surpassed wartime output figures.

Plans have been completed in Eastern Germany for the erection of a sulphuric acid plant with an initial capacity of 70,000 tons of SO_3, and orders have been placed for machinery and equipment. Anhydrite will be used as the raw material, and a new process will be employed. Production will begin in 1952. The plant will be located at Farbenfabriken Wolfen and its capacity may be doubled by 1955 if the new process proves satisfactory.

ITALY'S ORGANIC CHEMICAL INDUSTRY

Some Costly and Uncompetitive Production

HIGH costs, inefficient plant and uncoordinated production were among the problems retarding the development of the organic chemical industry to which attention was called in a recent survey made by Professor Arnaldo Corbellini.

High Prices

Italian prices were well above competitors, said the professor in an address to the chemical congress held at Milan earlier this year (*La. Chim. et l'Ind.*, 1950, *32* (9), 484-489). If this could not be remedied, Italy's exports might be so restricted that the chemical industry, and the manufacture of chemical plant, would become entirely dependent on the home market with such precarious protection as a tariff could afford.

The extent to which the Italian Government was likely to support the liberalisation of trade was not quite clear, but some greater protection for certain sections of the chemical industry was probable.

Regarding available home resources of raw material a distinction had to be drawn between the large scale organic industry catering for world wide markets and the numerous smaller concerns, the latter largely dependent on the by-products of coal, petroleum, natural gas, etc., exploited by the former. The lack of many basic materials was one of the main disadvantages besetting Italy's chemical industry.

The position was serious for the numerous smaller firms in Italy which had to depend largely on imported semi-manufactures. Their costs of manufacture were unavoidably high. Reference was made to the petroleum refineries, forming part of the OEEC plan for Europe, as one at least of the bright spots in Corbellini's rather gloomy picture. Methane or natural gas, in addition to its present principal use in Italy as fuel, could also become the basis of important organic industries.

Out-of-Date Plant

Another source of high costs in Italian organic chemical industry was the old and inefficient plant often still employed. Much of this could be remedied merely by adding another unit or by modifying some particular phase.

In the pharmaceutical section there appeared to be ample scope for reform, as its present structure tended to be very uneconomic. There was too much uncoordinated subdivision, the manufacture of a particular product being subdivided among numerous small and inefficient factories, and too many lines were attempted. There should be more rational selection. It would be better to manufacture a few products well and cheaply rather than several badly and expensively.

The situation regarding technical and scientific staff and chemical workers generally was also considered unsatisfactorily extravagant.

Spanish Steel Plans

THE Spanish Government, undeterred by the opposition of the country's iron and steel industry, has carried out its decision to set up a national corporation, the Empresa Nacional Siderurgica, the expressed aim of which is to double Spain's iron and steel output. The corporation is to erect a new plant in the Asturian industrial region in the vicinity of the ports of Gijon-Musel and Aviles. This is to turn out some 200,000 metric tons of crude steel at the end of the first constructional stage, and the capacity output, to be reached in about ten years, is estimated to aggregate 600,000 metric tons per annum.

The corporation, formed with the aid of the Government Instituto Nacional de Industria, is to be transferred to private interests at a later date. The belief that U.S. interests would participate in this scheme has not been confirmed.

The country's three leading iron and steel manufacturing concerns, Vasconia, Duro Felguera and Altos Hornos, which control together about 70 per cent of the total output, have observed the scheme with little enthusiasm. It is being pointed out in industrial quarters that existing plants are sufficient to re-establish the 1929 production figure, and even to exceed it, as the maximum capacity then amounted to 1 million metric tons. In 1929, a peak output of both steel (1,003,450 tons) and pig-iron (748,936 tons) was achieved. Much concern is being voiced in the old industrial region of Biscey on account of the exhaustion of the iron-ore deposits around Bilbao and Santander which, if not replaced, would completely alter the raw material position of the industry.

AMERICAN RUBBER

Commercial Possibilities of Guayule

SLOW but definite progress is being made towards the production of natural rubber within the United States. New high-yielding strains of the rubber plant guayule, a shrub that grows wild on the dry table lands of Mexico and Texas, have been developed. The new strains, according to the U.S. Department of Agriculture, are the result of an intensive breeding programme begun in 1942, and yield from 25 to 40 per cent more rubber than the best of the guayules produced during the war. One is a hybrid that breeds true from seed and carries the first generation hybrid vigour into succeeding generations without loss.

Research to explore crop possibilities in Mexico and Texas showed that guayule could be grown under irrigation as well as on dry land.

During the war guayule was grown in the United States under irrigation. Harvested at the end of two or three years it provided natural rubber at a cost justified only by the emergency. Continued study since the war, however, has shown that guayule has important possibilities for dry-land farming. Some 2 million acres in Texas in the low rainfall area may prove suitable for growing guayule.

Pilot plantings have been established in five locations in California to test new varieties and hybrids. These will determine the adaptability of guayule to varying soils and climates and give information on yields and costs of production. It is believed that seedlings of the new strains will produce about 1200 lb. of rubber per acre in five years.

Liquid Nitrogen for Pulverisation

A NEW method developed by the Linde Air Products Company (a unit of the Union Carbide and Carbon Corporation) utilises liquid nitrogen to provide rapid and effective pulverising of materials normally difficult or impossible to grind. The new technique employs liquid in spray form, and is said to cool the material rapidly to a point of maximum fragility and thereby reduce the amount of energy required to disintegrate it. It is claimed that the new process promises to accelerate the high-speed pulverisation of mechanically-hard or heat-sensitive materials such as plastics, insecticides, substances containing vitamins, and other organic materials.

U.S. CHEMICAL ENGINEERS

Wide Range of Activities

ABOUT 1500 engineers and executives of the chemical and allied industries are expected to take part in the 43rd annual meeting of the American Institute of Chemical Engineers to be held at Colombus, Ohio, from December 3-6. Forty-two papers, covering glass manufacture, viscous materials, phase equilibria, air pollution, ultrasonics, and many other topics, will be presented.

Four papers, dealing with glass processing, will cover refractories problems in the industry, glass as a material for the chemical industry, the fracturing of glass, and chemical engineering aspects of flat glass, glass block, and Foamglas.

Engineering for Plastics

The processing of viscous materials, such as lubricants, syrups, etc., will be discussed in another session of four reports. Two will deal with practical mixing techniques and heat-transfer problems; another will survey factors in the processing of sugar products and molasses. Engineering calculations for a psuedo-plastic fluid will be presented for the first time, in a paper dealing with pressure drop of fluid polystyrene in conduits.

Vapour-liquid equilibria will be one of the main topics at the symposium of eight papers on phase equilibria.

Air Pollution Control

The new awareness of the need for air-pollution control is reflected by the inclusion of six papers, three being contributions to the study of air pollution by the investigation of air pollution by particulate matter, the sampling of contaminants above ground level, and actual observations on dispersion from short stacks. The Oak Ridge National Laboratory will provide an entirely modern treatment concerning the disposal of radioactive gases. A general survey will be given of air-pollution control in the chemical industry, and two papers will discuss electrostatic and sonic precipitation, and the performance of industrial aerosol filters.

Among the general papers will be a Bureau of Mines report on liquid-phase hydrogenation of coal at low pressures (1500 psig.), data on a new catalyst for de-alkylation of aromatic hydrocarbons (alumina activated with anhydrous HF), and a special report on a continuous cold rubber process.

• OVERSEAS •

German Plans for I.G. Farben

Reorganisation of the I.G. Farben chemical combine into three main groups based on the principal plants at Ludwigshafen, Frankfurt, and Leverkusen is proposed by the Federal German Government in plans submitted to the Allied High Commission.

I. G. Farben is at present in process of being liquidated. The German scheme is for various smaller plants to be attached to the main three on a geographical basis. A number of isolated Farben plants would be reorganised under entirely separate management. By this means the Germans contend that the combine would be split into sufficiently small units to satisfy Allied anti-cartel legislation.

General acceptance of these plans by the Allied authorities is considered likely and the reorganisation may well be under way by Christmas.

Proposals have also been completed by experts representing Allied and German views and these are also to be scrutinised by the Allied High Commission.

Indian Chemical Imports

The conclusion that India has continued to hold her position during the post-war years as the largest market for United Kingdom chemicals, drugs, dyes and colours is put forward in *Indian Trade and Industry* (October 6, .published by the Commerce Department of the High Commission of India). In a summary of the main categories of Indian imports from the U.K., the review shows the total of chemicals, etc., has risen in value from £2.8 millions in 1938 to £9.3 m. and £9 m. in 1947 and 1948 and in 1949 reached £10.2 m. Generally, British share in consumer and capital goods trade in India has shown a small but continuous decline since 1947.

India's drive for fuller industrialisation is reflected in the fact that the other marked exception to the downward trend, in addition to chemicals, was machinery the value of which in the last three years was (in £ millions) 29.8, 33.6 and 38.9. In 1938 machinery for India realised £7.8 million.

China Stops Wolfram Exports

Wolfram exports from China have been barred by the Communist authorities in Canton. The Hong Kong market is said to be practically without supplies and the whole of the wolfram supplies of South China are now being sent to Russia under a barter treaty.

U.S. Non-Ferrous Metals

Demand for all non-ferrous metals continues in the U.S.A. and is in excess of available supplies. Stocks of zinc are now the lowest for 25 years, although domestic output is the highest for six years, while any surplus that previously existed in lead stocks has now been eliminated.

Copper also remains scarce and a U.S. Government Order establishing the quota of copper output to be used for defence purposes is expected shortly. It is expected to be modelled on lines similar to the Order issued for steel. Makers do not anticipate that they will have to contribute more than 20 to 25 per cent of copper supplies for defence purposes.

A reduction of about 35 per cent in the non-military use of aluminium beginning in January, was ordered by the Government on November 13. More than 30 per cent of the supply of aluminium was needed for the present defence programme, including reserve stocks, according to Mr. William M. Harrison, Administrator of the National Production Authority.

Brazilian Manganese

Since the U.S.A. was denied its Russian source of manganese ore in 1949, there has been much interest in the possibility of stimulating the export by Brazil of this ore in competition with India and South Africa. The State of Sao Paulo draws supplies for its steel industry from the Mines of Minas Geraos, but the capacity of the railways is insufficient to increase by a wide margin the quantities transported to the coast for shipment. Total Brazilian production during the last few years has averaged about 182,000 tons per annum, of which some 32,000 tons have been consumed in domestic industry and the remainder exported. However, in the first quarter of this year, exports rose to an average of 16,250 tons per month. If this rate is maintained total exports for the year will show a useful increase over the 1949 total of 150,000 tons.

Australian Lead Mine Project

Plant to treat 80 tons of lead daily and progressively to increase that output will be erected at the Prothero lead mine, Northampton, Western Australia. The mine, which is claimed to be exceptionally rich, has been acquired by Anglo-West Australian Mining in which American Smelting, Mount Isa, Mining Trust and Terra Nova Properties are interested.

· PERSONAL ·

MR. S. J. L. HARDIE has resigned as chairman and as a director of British Oxygen Co., Ltd., in view of his appointment as chairman of the Iron and Steel Corporation of Great Britain. The vice-chairman of the company, MR. J. S. HUTCHISON, has been elected chairman, and MR. F. C. S. LEWIN-HARRIS and MR. JOHN L. HARDIE have been appointed to the board.

At the annual general meeting of the British Colour Makers' Association the following officers and council were appointed for the ensuing year:—Chairman: MR. H. GOSLING (Cornbrook Chemical Co., Ltd.); vice-chairman: DR. H. SAMUELS (I.C.I., Ltd.); hon. treasurer: MR. C. G. A. COWAN (Cowan Bros. (Stratford), Ltd.); Council: MR. C. M. BEAVIS; MR. F. BURRELL; MR. H. GOSLING; MR. J. H. GRIMSHAW; DR. H. SAMUELS; MR. V. WATSON; MR. H. A. WILSON; and MR. C. E. YOUNG; secretary: MR. A. J. HOLDEN. MR. J. H. GRIMSHAW (Horace Cory & Co., Ltd.), the retiring chairman, presided at the association's first annual dinner, at which the toast of the association was proposed by MR. J. DAVIDSON PRATT, director and secretary of the ABCM.

DR. BERNARD RAISTRICK has been appointed research manager of the new central research department for fertilisers which Scottish Agricultural Industries, Ltd., is to establish in the Edinburgh area. He will take up the appointment on January 1, 1951. Dr. Raistrick is at present assistant director of research with Albright & Wilson, Ltd. The new department will be engaged mainly on research into problems of the manufacture of phosphatic and other fertilisers.

MR. PERCY A. HOLT, joint managing director of Bradford Dyers' Association, Ltd., has been appointed president of its Canadian company, Bradford Dyeing Association (Canada), Ltd. He will maintain his headquarters at the Bradford offices of the BDA, with which he has been associated since 1922.

MR. E. S. WADDINGTON, of the industrial department of Philips Electrical, Ltd., has been appointed by the Institute of Welding to the British Standards Institution's technical committees PSM/8 and PSM/8/1.

MR. HARRY IBBETSON, at present general secretary of the Textile Institute, Manchester, will shortly be relinquishing that position to take up the secretaryship of the International Wool Secretariat, in London.

The following assistant chief engineers have been appointed to the general engineering department of Metropolitan-Vickers Electrical Co., Ltd.: MR. F. B. HOLT (Industrial), MR. D. R. LOVE (Mining) and MR. W. J. PRICE (Power).

November 13 marked the centenary of the birth of SIR JOHN WILLIAMS BENN, founder of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE.

MR. ERNEST T. NEATHERCOAT, chairman and managing director of Savory & Moore, Ltd., and associated companies and formerly president of the Pharmaceutical Society of Great Britain, left £163,967 (duty paid £35,488).

MR. G. W. HESLETT, chief estimating engineer of Sulzer Bros. (London), Ltd., has been appointed manager of its pump department.

Royal Institution Lectures

THE annual series of lectures before Christmas given at the Royal Institution, Albemarle Street, London, covers the usual number of interesting subjects. Crystallography in modern science is the subject of a course being held on Tuesdays at 5.15 p.m., the last of which, on November 21, deals with crystallography in chemistry and is being given by J. Monteath Robertson, Gardiner Professor of Chemistry, University of Glasgow. Another course of four lectures which is to be given on Thursdays this month is by L. R. G. Treloar on "The Physics of Rubber Like Materials."

Obituary

The death has occurred of MR. CHARLES GANDY, chairman of the National Smoke Abatement Society. He originated the conception, in 1935, of smokeless zones in towns which, in ten years, was endorsed by a Government committee, and has now been incorporated in a growing number of local Acts of Parliament.

• HOME •

Midlands Building Exhibition

THE CHEMICAL AGE will be represented at the Midlands Building Trades' Exhibition at Bingley Hall, Birmingham, on February 14-24, 1951.

Developing New Dyestuffs

The efforts of chemists and technologists to discover, produce and promote the use of new dyestuffs was apt to be taken for granted said Mr. H. B. Bradley of I.C.I., Ltd., speaking in Manchester last week. Research on a very extensive scale was continually being carried out for the benefit of industry.

FBI Overseas Scholarships

A young electrical engineer from Chile recently arrived in this country for a course of practical works training, is the first of 100 graduates to be offered engineering scholarships under a scheme of the Federation of British Industries. Scholarships are offered for two-year periods and students are chosen by a local overseas selection committee representing the FBI and the Government concerned.

Some Polythene Bags Tax-Free

In consultation with the British Plastics Federation, the Customs authorities have decided that, for an experimental period of six months, bags made wholly of polythene film, not exceeding .002 in. in thickness shall be exempt from purchase tax. Polythene bags exceeding .002 in. in thickness remain chargeable with tax at the rate of 66⅔ per cent of the wholesale value.

Technical and Scientific Employment

The total number of persons enrolled on the Technical and Scientific Register at September 11, was 5747, which included 3960 registrants is work but desiring a change of employment, and 1787 unemployed. During the four-week period August 15 to September 11, 816 vacancies were notified by employers to the appointments offices, 284 were filled, and 713 cancelled or withdrawn.

Reaction in Tin

After a sharp rise to the high level of £1,280 for cash on November 7 prices have closed below the best. After a new record of £1,300 a ton on November 8 cash was finally more than £20 down. Following further setbacks there were some gains on November 13, the cash price being £1107 10s. The market on November 14 was quiet, cash quotation being £1075 and three months £1085-£1040.

Branch Office

Richard Sutcliffe, Ltd., announces the address of its Newcastle-on-Tyne office is 17 Sandhill.

New Cement Works

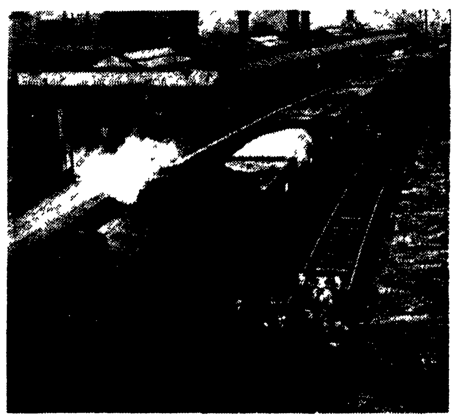
The Minister of Town and Country Planning has granted conditional permission for British Portland Cement Manufacturers, Ltd., to erect a new works at Cauldon Low, a spot noted for its rural beauty, near Cheadle, Staffs.

Glass Plant Expansion

A project to double the production capacity of its Birmingham works was announced last week by the Triplex Safety Glass Co. Mr. Arthur Cochrane, assistant managing director, said it was hoped the work would be completed by the end of 1951. Cost of the extensions, excluding plant and machinery, would be £80,000. No additional capital would be raised.

Coal Production

Output of coal last week was slightly higher than in the previous week but substantially less than in the corresponding week last year. Comparative figures are: Last week: 4,422,100 tons (deep-mined 4,171,300 tons, opencast 250,800 tons). Previous week: 4,393,700 tons (deep-mined 4,152,600 tons, opencast 241,100 tons). Week ended November 12, 1949: 4,477,100 tons (deep-mined 4,251,100 tons, opencast 226,000 tons).



Mechanical handling equipment leaving Ossett station, near Wakefield, Yorkshire, for Spain. Only about half the train can be seen in the picture. The order was supplied by Richard Sutcliffe, Ltd., and was valued at more than £100,000.

The Stock and Chemical Markets

STOCK markets have been more active recently. There has been a tendency for business to concentrate more on industrial shares, which remained firm. This is in contrast to commodity shares and British Funds, which lost part of recent gains. It is assumed that most industrial companies will be able to maintain dividends, and a number of small increases are expected over the next few months. It is unlikely that there will be any breakaway from the present policy of moderate dividend payments. Industrial shares offer quite attractive yields, and where company activities centre on export trade or rearmament, dividends should be maintained in 1951 despite further possible increases in taxation.

The favourable yields offered at current prices tended to draw more attention to chemical shares. Imperial Chemical have been active around 43s. 3d., partly on the news that the company is to produce Terylene. Although plant for this new textile fibre will cost several millions, no further increase in I.C.I. capital is expected. It is believed that the company will be able to maintain the 10 per cent dividend in future despite the interest requirements of the loan stock issued earlier this year.

Monsanto 5s. shares have been firm at 51s., Laporte Chemicals 5s. units were 10s. 3d. and Fisons, at 29s., remained firm on the good impression created by the full report and accounts. W. J. Bush have risen to 91s. 3d. on the share bonus, which is welcomed in the City because it will increase the number of shares in issue. This will widen the market in these shares, at present somewhat restricted because the shares are usually firmly held.

Albright & Wilson firmed up to 30s. 3d., Brotherton 10s. shares were 20s. 6d., Bowman Chemical 4s. shares, 6s., Boake Roberts, 34s. 9d., F. W. Berk, 12s. 9d., Amber Chemical 2s. shares, 2s. 9d., Pest Control 5s. shares. 7s. 4½d., and British Chemical & Biologicals 4 per cent preference, 16s. L. B. Holliday 4½ per cent preference were 19s. 9d., and Woolley 4¾ per cent debentures, 104½.

Glaxo Laboratories rose to 57s. on the full results and annual statement. The authorised capital is being increased and it is assumed that when more money is required it will be raised by an issue to shareholders on attractive terms. Triplex Glass have been active up to 28s. on the plan to double the output of the Birmingham works. This will not involve any increase in capital and has aroused hopes that a further increase of dividend may be in prospect.

United Molasses were easier at 46s. 3d. on conflicting views as to the effect of the rising price of molasses on the company's world-wide business. The 4s. units of the Distillers Co. held firm at 19s. 9d., and shares of plastics companies were again more active. British Xylonite were 85s. 7½d. and British Industrial Plastics 2s. shares were 6s. 7½d. Kleemann have continued to fluctuate around 9s. 7½d. following publication of the financial results. British Oxygen were good at 85s. 7½d. "ex rights" to the new shares, which were 19s. premium over the offer price. It is believed that there are good prospects of the dividend being maintained on the larger capital. The terms of the Dunlop Rubber share offer to shareholders are expected next week. British Glues 4s. shares have been firm at 22s. and Boots Drug were 49s. 9d.

Among iron and steels, Guest Keen at 49s. 9d. continued active on market assumptions that the dividend total is likely to be raised. Oil shares failed to hold all earlier gains, but remained more active.

Market Reports

BUSINESS on the industrial chemicals market during the past week has been brisk, and in most sections, more especially the heavy chemicals, new bookings have been fairly substantial. The overall demand for export has been sustained and in some directions supplies are reported to be difficult to negotiate. The call for potash compounds remains persistent and the whole range of soda products continues active, but no change in makers' prices has been recorded. Cream of tartar, hydrogen peroxide, bleaching powder, barium chloride, arsenic and formaldehyde are all in active request, and among the non-ferrous metal compounds white and red leads are being called for at the higher prices now ruling. The increased rates for glycerine have not restricted the demand and supplies of both the crude and refined are finding a ready outlet. A strong undertone prevails on the coal tar products market, with the home and export demand for creosote oil and cresylic acid continuing brisk. Pitch is also moving well with

(continued at foot of following page)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

A. S. BREWER & CO. (PLASTICS), LTD., London, E.C. (M., 18/11/50). October 10, £1500 deb., to Branch Nominees, Ltd.; general charge.

POULTEN, SELFE & LEE, LTD., London, E., glassware manufacturers. (M., 18/11/50.) October 14, £3000 mort. to Hastings Permanent Building Society; charged on properties in Wickford. *Nil. June 21, 1949.

Satisfaction

FREDK. BOEHM, LTD., London, W., manufacturers of oils, fats, etc. (M.S., 18/11/50). Satisfactions October 17 of debentures registered June 20, 1933 and October 29, 1936.

Increases of Capital

The following increases of capital have been announced: ASTELL LABORATORY SERVICE CO., LTD., from £2000 to £5000; WATTEN EMULSIFYING MACHINES, LTD., from £5000 to £15,000.

Company News

British Celanese, Ltd.

Net profit on the year's trading to June 30 of British Celanese, Ltd., is announced at £1,562,048. A dividend of 10 per cent for the year on the ordinary stock has been declared. The 31st annual general meeting is to be held on November 30.

British Chemicals and Biologicals, Ltd.

Trading profits of the group for the year ended June 30, £236,835 (£181,179). Net profit of British Chemicals and Biologicals £73,374 (£39,700). To general reserve £50,000 (nil).

Calor Gas Holding Co., Ltd.

Net profit of Calor Gas Holding Co., Ltd., for year ending July 31, is announced as £79,567. A final ordinary dividend of 20 per cent has been declared, making a total of 32½ per cent for the year.

Evans Medical Supplies, Ltd.

An interim dividend of 3 per cent has been declared on the ordinary stock of Evans Medical Supplies, Ltd., for the year ended December 30.

Fisons, Ltd.

Substantial changes are recorded in the report of Fisons, Ltd., for the year ended June 30. Total assets are now £15,560,071 (£9,403,139). Additional funds from issues made in September 1949 and March last are not fully deployed, but cash holding is increased from £98,000 to £2 m. Group trading profits £1,233,724 (£707,438). Government restriction on the supply of sulphuric acid is affecting the current production programme.

Glaxo Laboratories, Ltd.

Consolidated trading profit of Glaxo Laboratories, Ltd., for the year ended June 30, was £2,711,511 (£1,960,996). Research outlay alone was ten times greater than before the war. The authorised capital is to be doubled to a total of £3 m. No immediate issue is contemplated. The final ordinary dividend of 12½ per cent will make a total of 17½ per cent for the year.

THE STOCK AND CHEMICAL MARKETS

(*continued from previous page*)

an increasing call for shipment. The light distillates remain steady and unchanged.

MANCHESTER.—There has been a fairly active inquiry during the past week in the Manchester chemical market, on both home and export account. Interest has been displayed in a wide range of products. Instructions for delivery under existing contracts have been on a substantial scale and have included bleaching, dyeing and finishing chemicals and other bread-and-butter lines. Values are on a firm basis in nearly all sections. There is a good demand for basic slag and one or two other fertiliser items, including compounds. The call for most tar products has been on a steady scale.

GLASGOW.—Business in the Scottish heavy chemical market has been steady during the past week but prices continue to increase. There has been no change in the export position.

Next Week's Events

MONDAY, NOVEMBER 20

Royal Institute of Chemistry

Leeds: University, 6.30 p.m. Annual general meeting. Dr. H. J. T. Ellingham: "Chemical Energy."

Electrodepositors' Technical Society

London: Northampton Polytechnic, St. John Street, E.C.1, 6 p.m. T. Dennison: "The Manufacture and Fabrication of Steel with Special Reference to Surface Quality" (illustrated by Technicolour sound film).

Société de Chimie Industrielle

Paris: International Analytical and Experimental Chemistry Congress (until Nov. 24). Secretary: 28 Rue St. Dominique, Paris, 7.

TUESDAY, NOVEMBER 21

Society of Chemical Industry

Liverpool: University, 6.30 p.m. Castner Memorial Lecture. Dr. Christian Aall: "Electrothermics and Electrothermal Processes."

London: Burlington House, Piccadilly, W.1, 6.30 p.m. (Plastics and Polymer Group—Faraday Society invited). W. Reddish (I.C.I., Ltd., Plastics Division): "Dielectric Properties of Terylene."

London: Royal College of Science, S.W.7, 5 p.m. (Agricultural Group). H. Trefor Jones: "Magnesium as a Plant Nutrient."

Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. R. Holroyd: "Some Aspects of Semi-technical Scale Experimentation in Chemical Industry."

Royal Institute of Chemistry

Welwyn Garden City: The Cherry Tree, 8 p.m. (With Welwyn Garden City Scientists' Club.) Dr. H. P. Koch: "Some Applications of Infra-red Spectroscopy to Organic Research."

The Royal Institution

London: 21 Albemarle Street, W.1, 5.15 p.m. J. Monteath Robertson: "Crystallography in Chemistry."

WEDNESDAY, NOVEMBER 22

Society of Chemical Industry

London: National Institute for Medical Research, Mill Hill, 6.15 p.m. (Food Group, Microbiological Panel.) "Recent Aids to the Study of Microbiology," introduced by Sir Alexander Fleming. "The Electron Microscope," Dr. W. J. Elford; "Phase Contrast Microscopy," D. A. Tanfield and Dr. W. H. Hughes.

Institute of Chemistry of Ireland

Dublin: University College, 7.45 p.m. Presidential address, A. G. G. Leonard: "I Remember—."

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 2.30 p.m. Albert Parker: "Cities Without Smoke."

Plastics Institute

Glasgow: 39 Elmbank Crescent, 7.30 p.m. R. G. Farnsworth: "Thermosetting Moulding Materials and Recent Developments."

Fuel Efficiency in Industry and Home

Manchester: City Hall, Deansgate. Exhibition (until December 2).

THURSDAY, NOVEMBER 23

The Chemical Society

Bangor: University College of North Wales, 5.45 p.m. Tilden Lecture. Dr. F. L. Rose: "A Chemotherapeutic Search in Retrospect."

Edinburgh: North British Station Hotel, 7.30 p.m. (With RIC and SCI.) Prof. D. H. Hey: "Homolytic Aromatic Substitution."

Liverpool: University, 4.30 p.m. (With RIC, SCI and BAC.) Prof. R. D. Haworth: "The Chemistry of Tropolone and Some of its Derivatives."

Royal Institute of Chemistry

Bristol: University, 8 p.m. (With the Chemical Society and SCI.) Dr. D. W. Kent-Jones: "Cereal Chemistry."

Chatham: Sun Hotel, 7.30 p.m. Dr. N. O. Clark: "Chemistry and Fire Fighting."

Plastics Institute

London: Waldorf Hotel, Aldwych, W.C.2, 6.30 p.m. N. G. H. Thomas and D. G. Cavanagh: "A Survey of Polystyrene Developments."

Institute of Fuel

London: Institute of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Dr. J. A. Cooper and L. W. Young: "The Performance and Efficiency of an 800-lb./sq. in. Pulverised-Fuel-Fired Boiler Plant over a Period of 20 Years."

FRIDAY, NOVEMBER 24

The Chemical Society

Newcastle-on-Tyne: King's College, 5 p.m. Reading of Original Papers.

St. Andrews: United College, 5 p.m. Prof. D. H. Hey: "Homolytic Aromatic Substitution."

(continued at foot of following page)

New Companies Registered

Nu-Air Products (London), Ltd.
Private company. (487,992). Capital £100. Manufacturers of air freshening products and other deodorants of all types, etc. Subscribers: R. G. Baxter and E. A. Dodd. Reg. office: 1 Balfour Place, W.1.

Kylon, Ltd.
Private company. (487,916). Capital £10,100. To develop, manufacture and market biological, pharmaceutical and chemical preparations and appliances. Directors: Ernest F. Budd, Robt. Fraser, Otto Koblitz and Andrew W. Letts. Reg. office: Central House, Finsbury Square, E.C.2.

Medical Gases, Ltd.
Private company. (487,762). Capital £10,000. Manufacturers of medical gases, oxygen, drugs, medicines, chemical fertilisers, etc. Subscribers: H. Goodwin and J. McIndoe. Managing director: W. R. Smith. Reg. office: 121 Clarendon Street, Hull.

Micro-Nutrients Holdings, Ltd.
Private Company. (487,360). Capital £100. Objects: To acquire and exploit patent rights, formulae, etc., in connection with industry, foodstuffs, agriculture, etc. Director: C. Townsend. Reg. office; 448 Strand, W.C.2.

J. W. Sutcliffe & Co. (1950), Ltd.
Private company. (486,083). Capital £10,000. Manufacturers of bottles, carboys, etc. Directors: T. C. Sutcliffe, C. T. Sutcliffe, J. E. Sutcliffe, and L. C. Cox. Reg. office: 12 Gt. Portland Street, W.1.

Whitfield (Engineering) Chemical Co., Ltd.
Private company. (485,521). Capital £2500. Objects: To acquire the business of chemical manufacturers and sheet metal workers heretofore carried on by Whitfield Chemical Works at 79 Blackman Lane, Leeds. Director: G. Johnson, 11 Raynel Gardens, Leeds, 6. Reg. office: 79 Blackman Lane, Leeds.

Weldyne Plastics, Ltd.
Private company. (487,808). Capital £100. Designers and manufacturers of industrial or general thermoplastic welded articles. Directors: Sydney McGregor, director of Radyne, Ltd., etc.; Jas. F. Cullingham, Edmund C. Stanley and Christopher E. M. Tibbs, all directors of Radio Heaters, Ltd. Reg. office: 42 Bedford Avenue, W.C.1.

Noso Products, Ltd.
Private company. (488,138). Capital £2500. Manufacturers, importers and exporters of and dealers in all types of chemical products, adhesives, oils, colours, varnishes, dyestuffs, etc. Directors: F. W. Parr and S. G. Burgess. Reg. office: 120 Bute Street, Cardiff.

Lantigen (Export), Ltd.
Private company. (488,120). Capital £1000. Manufacturers, distillers and refiners of vaccines, sera, pharmaceutical, medicinal, chemical and industrial preparations and articles. Subscribers: J. Stanners and Mrs. J. G. Stanners. Reg. office: 'Pinewood,' College Road, Bagshot, Surrey.

Camot Products, Ltd.
Private company. (488,066). Capital £5000 in 2000 6 per cent cumulative preference and 2000 ordinary shares of £1 each, and 4000 founders' shares of 5s. each. Objects: To carry on the business of manufacturers of and dealers in various products, including tools, greases, oils, soaps, etc. Directors: Arthur E. Temple and Arthur G. Temple, both of 12 Osborne Gardens, Monkseaton; Chas. P. MacCarthy (managing director) and Franklin Scott. Solicitors: Smirk & Thompson, 86 Pilgrim Street, Newcastle on Tyne.

NEXT WEEK'S EVENTS

(continued from previous page)

FRIDAY, NOVEMBER 24

The Royal Institution
London: 21 Albemarle Street, W.1, 9 p.m. Sir Edward Appleton: "The Sun as a Radio Emitter."

Royal Institute of Chemistry
Glasgow: Royal Technical College, George Street, 7.15 p.m. Prof. D. H. Everett: "Electrostatic Forces in Chemistry."

Institution of Plant Engineers
Birmingham: Imperial Hotel, 7.30 p.m. R. Bramley-Harker (H.M. Inspector of Factories): "The Plant Engineer and the Factories Act."

SATURDAY, NOVEMBER 25

Royal Institute of Chemistry
Wrexham: 6.30 p.m. (North Wales Section). Prof. M. Stacey: "Advances in Carbohydrate Chemistry."

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Nephelometers.—Evans Electroselenium, Ltd., and G. C. Collins. Sept. 16 1949. 645,511.

Method and apparatus for the electrolytic coating of metal strip.—W. W. Triggs. Sept. 28 1948. 645,546.

Catalytic treatment with hydrogen of glyceride oils.—Lever Bros. & Unilever, Ltd. Oct. 4 1948. 645,551.

Infra-red gas analysing apparatus.—C. A. Parsons & Co., Ltd., and A. E. Martin. Sept. 22 1949. 645,575, 645,576.

Wool dyeing process.—I.C.I., Ltd., D. R. Lemin, and I. D. Rattee. Oct. 24 1949. 645,594.

Working hard glass bodies by electric heating.—Corning Glass Works. Nov. 8 1948. 645,521.

Production of melamine.—British Oxygen Co., Ltd., J. W. Haworth, and M. G. Cooper. Oct. 25 1949. 645,600.

Purification of aqueous solutions of formaldehyde.—British Celanese, Ltd. Nov. 10 1948. 645,601.

Sintering of iron ore.—United Steel Co., Ltd., G. D. Elliot, and F. Dunhill. Dec. 19 1949. 645,523.

Detection of leakage into vacuum systems.—Metropolitan-Vickers Electrical Co., Ltd., J. Blears, and J. H. Leck. Nov. 28 1949. 645,526.

Metallurgical processes for producing materials or articles of platinum or allied metals, or their alloys, and materials or articles made by or from the products of such processes.—Lodge Plugs, Ltd., and C. J. Smithells. Dec. 10 1945. 646,002, 646,003, 646,004.

Process for the manufacture of polymethine dyestuffs.—Gevaert Photo-Producten, N.V. April 12 1946. 646,123.

Apparatus for incorporating air or other gases into soap.—D. E. Marshall. April 30 1946. 646,008.

Coloured photographic layers.—Gevaert Photo-Producten, N.V. April 12 1946. 646,125.

Electron microscopes.—N.V. Philips' Gloeilampenfabrieken. Jan. 2 1947. 646,019.

Preparation of antispasmodic agents.—Winthrop-Chemical Co., Inc. Jan 24 1947. 646,198.

Artificial carbons for electrical and other uses.—Soc. Le Carbone-Lorraine. Feb. 4 1947. 646,023.

Removal of carbon dioxide in the separation of oxygen from air.—J. C. Arnold. (Standard Oil Development Co.). March 17 1947. 646,199.

Sensitizing of photographic emulsions and to the preparation of dyestuffs therefor.—Gevaert Photo-Producten, N.V. and Dormatl. May 3 1948. 646,187.

Process for the production of acid nitriles.—A. Abbey. (Armour & Co.). May 19 1947. 646,202.

Manuacture of basic esters of 1-aryl-cyclo-alkyl-1-monothio-carboxylic acids.—L. E. Jones. (J. R. Geigy Soc. Anon.). May 26 1948. 646,204.

Preparation of pteridines.—American Cyanamid Co. July 11 1947. 646,149.

Colloidal aqueous dispersions and methods of preparing same.—American Cyanamid Co. July 25 1947. 646,205.

Manufacture of derivatives of amino-carboxylic acids.—I.C.I., Ltd., W. Baird, E. G. Parry, and S. Robinson. July 14 1948. 646,033.

Thermoplastic synthetic resinous materials.—Crystalate, Ltd., and J. Lesser. Oct. 28 1948. 646,162.

Toxicants.—Nuodex Products Co., Inc. Oct. 20 1947. 646,207.

Treatment of Brewers' worts.—A. P. V. Co., Ltd., R. Seligman and S. W. T. Paine Oct. 6 1948. 646,208.

Processes for the prevention of corrosion and compositions therefor.—Shell Refinery & Marketing Co., Ltd. Oct. 30 1947. 646,209.

Phenolic resins and laminated insulating material bonded therewith.—E. H. G. Sargent. Nov. 5 1948. 646,170.

Manufacture of vat dyestuffs.—Ciba, Ltd. Nov. 18 1947. 646,171.

Process for the production of fluoranthene and its derivatives.—E. Bergmann. Nov. 18 1948. 646,214.

Manufacture of 2-Chloro-benzothiazoles.—Kodak, Ltd. Nov. 20 194. 646,045.

Manufacture of hydrophenanthrene derivatives.—Ciba, Ltd. Nov. 22 1947. 646,046.

Surface hardening of mild steel.—Soc. Anon. De Commentry-Four-Chambault & Decazeville. Nov. 28 1947. 646,069.

Manufacture of pyrimidylmercapto-carboxylic acids and derivatives thereof.—Ciba, Ltd. Dec. 4 1947. 646,070.

(continued on page 782)

Dialkylaminoalkyl ethers of certain polynuclear compounds.—G. D. Searle & Co. Dec. 15 1947. 646,048.

Dehydration of aqueous solutions of formic acid.—Usines De Melle. Dec. 31 1947. 646,219.

Production of arecoline.—Nopco Chemical Co. Jan. 12 1948. 646,220.

Preparation of dehydrated castor-oil.—L. Beyer & Sons, Ltd. Jan. 14 1948. 646,049.

Treated soya-bean oil and method of treating same to produce drying characteristics therein.—Harvel Research Corporation. Jan. 20 1948. 646,076.

Treated cottonseed oil and method of producing same.—Harvel Research Corporation. Jan. 20 1948. 646,077.

Matt colloid layers—J. A. H. Hart, Jan. 30 1948. 645,954.

Adhesive compositions.—B.B. Chemical Co., Ltd., W. H. Swire, and A. Hardy. Feb. 5 1949. 646,079.

Process for the manufacture of beta-acyloxy-aldehydes, carboxylic acids, glycols and glycol monoesters.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 11 1948. 645,956.

Process for the preparation and application of reactive phenol-aldehyde resins.—Beck Koller & Co. (England), Ltd. Feb. 12 1948. 646,080.

Arc-welding electrodes.—Mond Nickel Co., Ltd. Feb. 25 1948. 645,958.

Process for the production of esters of allyl-type alcohols.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Feb. 26 1948. 646,052.

Process for isolation of cholesterol from wool wax alcohols.—Organon Laboratories, Ltd., and C. L. Hewett. Feb. 28 1949. 646,227.

Transparent metal fabricating lubricant.—Standard Oil Development Co. March 9 1948. 646,187.

Compositions containing soapless detergents.—I.C.I., Ltd., and F. J. Pollok. Feb. 4 1949. 646,088.

Production of organic chlorothionophosphates.—American Cyanamid Co. April 2 1948. 646,188.

Zinc base aluminium containing die casting alloys.—British Thomson-Houston Co., Ltd. April 6 1948. 646,233.

Moulding compositions.—I.C.I., Ltd., and S. F. Pearce. April 20 1949. 646,093.

Carbon savers for carbon arc lamps.—E. N. Hirst. May 23 1949. 646,095.

Devices for continuous purification by means of dialysis of liquids containing impurities of colloidal nature.—N.V. Onderzoekingsinstituut Research. April 30 1948. 646,238.

Pigments of the oxazines series.—I.C.I., Ltd., and R. W. G. Preston. May 11 1949. 646,099.

Manufacture of organic oxidation products.—Distillers Co., Ltd., E. G. E. Hawkins, D. C. Quin, and F. E. Salt. May 18 1949. 646,102.

Trithioacetals.—Ilford, Ltd., F. P. Doyle, and J. D. Kendall. May 11 1949. 645,965.

Dyestuff intermediates.—Ilford, Ltd., F. P. Doyle, and J. D. Kendall. May 11 1949. 645,966.

Cyanine dyestuffs.—Ilford, Ltd., F. P. Doyle, and J. D. Kendall. May 11 1949. 645,967.

Symmetrical dicarbocyanine dyestuffs and sensitising photographic emulsions.—Ilford, Ltd., F. P. Doyle, and J. D. Kendall. May 11 1949. 645,968.

Production of viscose rayon threads.—Courtaulds, Ltd., J. H. Givens, and L. Rose. May 23 1949. 645,969.

Coal carbonisation and gasification.—Hydrocarbon Research, Inc. June 7 1948. 646,105.

Preparation of phenyl silicon trichloride.—Dow Corning Corporation. June 29 1948. 645,972.

Process for producing anhydrous sodium sulphate from Glauber's salt.—Courtaulds, Ltd., and H. J. Hegan. July 1 1949. 646,111.

Disinfectant and deodorant compositions.—Continax, Ltd., North Western Laboratories, Ltd., and S. King. July 26 1949. 645,976.

Roasting zinc ore.—W. W. Triggs. (Dorr Co.). July 30 1948. 645,977.

Preparation and purification of antibiotics.—Wellcome Foundation, Ltd., and S. R. M. Bushby. Aug. 4 1949. 646,258.

Surface hardening of rail ends.—British Oxygen Co., Ltd. Aug. 5 1948. 646,259.

Stabilisers for photographic emulsions.—Ilford, Ltd., J. D. Kendall, and H. G. Suggate. Aug. 3 1949. 645,979.

Production of triazale derivatives.—Ilford, Ltd., J. D. Kendall, and H. G. Suggate. Aug. 3 1949. 645,980.

Process for the purification of xylenes by distillation.—I.C.I., Ltd., and G. H. Foxon. Aug. 10 1949. 646,116.

Process for the purification of xylenes by distillation.—I.C.I., Ltd., and G. H. Foxon. Aug. 10 1949. 646,261.

Colouring of textile materials.—British Celanese, Ltd. Sept. 24 1948. 645,987.

Manufacture of germanium rectifier crystals.—Westinghouse Brake & Signal Co., Ltd., A. Jenkins, and K. A. Garrod. Oct. 10 1949. 646,278.

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Perfecting Analysis

THE extremely rapid advances made in the equipment, methods and capabilities of modern analysis have placed this branch of chemistry on a plane which calls for a very high standard of performance in all the contributory departments. Obviously, however, there are a number of ways in which the full advantages of the new techniques, and the progressiveness of most present-day analysts, are being rendered much less effective than they could be. Slipshod practice in sampling is one of them.

When, for example, it is established that duplicate determinations of sulphur in an oil sample have differed by 0.02 per cent, what firm conclusion can possibly be drawn about the actual sulphur content of the consignment? In the conditions in which some laboratory samples are taken it is doubtful if it would be safe to give any ruling about the content of the bulk material. One of the reasons is that the sampler too often is still a very lowly individual, sometimes virtually untrained and generally unsupervised. Yet on this insecure base of non-representative sampling may be built the most elaborate superstructure achieved by polarographic analysis and other precise and elaborate physical chemical methods. Much can be done simply by a little intelligent investigation by the chemist looking for sources of heterogeneity or periodicity in the consignments and evidence of stratification or differences in surface and bulk. Briefly, procedure and analytical technique have advanced very m ch faster than have the routine activities, but there are still other chinks in the analyst's equipment, especially perhaps the inadequate use made of the mathematician's advantages.

Too few analysts collaborate with the mathematician or possess themselves of much of his equipment. The scope of chemical analysis should certainly not stop short of mathematical analysis of laboratory results. The recent annual publication, the *Transactions* of the Institution of Chemical Engineers, bears witness to the importance of the mathematical method in an associated field.

It is still common to carry out chemical analyses in duplicate and to take agreement between the two as sufficient evidence of accuracy of the laboratory method. That disregards the fact that duplication measures only the accuracy of one analyst and of one sample. Duplicates by one analyst, using one sample bottle and the same set of apparatus, certainly give better agreement than would true duplication—of analysts' samples and

On Other Pages

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apparatus—but the accuracy of prediction cannot be of a high order.

These are, of course, not the only respects in which industrial analysis still falls a long way short of the ideal. Even the best estimate of, say, an element in a product, relates only to the time at which it was taken. The chemist is not often invited to consider possible causes of change in quality, such as the influence of change of ambient temperature during the day, and to space the sampling so as to compensate for this. It may be necessary to alter his sampling policy and procedure, which would be troublesome but generally fully justified.

In a broader field of analysis—of chemical results—some have noted another serious defect of the traditional methods. In a system of many variables, effects are investigated by holding constant all but one of the variables. Effects produced by altering each one in turn are then noted. The sheer complexity and number of experiments demanded by this approach are self-evident. This is itself a major drawback, yet there is one more fundamental. We may be missing the evidence of interaction between effects.

"We have usually no knowledge that any one factor will exert its effect independently of all others that can be varied," wrote Professor R. A. Fisher, F.R.S., who decided that any investigator who proceeds along these lines was probably "the unfortunate victim of a doctrinaire theory as to how experimentation should proceed." The mathematicians are fortunately again able to point a way out of this dilemma. There is more than one method of laying out groups of experiments involving variation of several factors. When a system is capable of being affected by changes in concentration, pressure, temperature and flow rate a scheme can be devised to test all four at four separate levels. The results may then be analysed for the influence of each variable and for their interaction. There, as Brownlee points out in "Industrial Experimentation" (HMSO, 1949), a comparison of catalysts for contact oleum manufacture might be made at one temperature X and A found better than B. Meanwhile another investigator, ascertaining the most effective inlet gas temperature on catalyst B, may well have shown that at Y degrees, catalyst B is better than A.

For most of us, fairly advanced applications of mathematics hold no charm. It is, however, very clear that, challenged by the exactitude which current technique and present-day instruments permit, the rule-of-thumb philosophy has had its day.

Notes and Comments

Soaring Chemical Exports

THIS year is making at its close a series of records for sales of British chemicals in the markets of nearly all countries of a magnitude which easily outstrips the more optimistic estimates of the Economic Surveys. October's total of nearly £10.6 million represents the effect of largely increased orders from most countries—except Argentina and the territories under U.S.S.R. influence—whose capacity to continue purchases on the same scale may be doubted. It is fairly clear, however, that not all these are strategic purchases; much of the increment has come from Commonwealth countries and the marked revival of the important Indian market, which was for long virtually closed to some of the important basic chemical materials, has been a substantial factor. The influence of American policies, which has resulted in some restriction of its chemical shipments, cannot be dismissed in assessing the continuance of these boom conditions. Even more remarkable is the five-fold increase in dollar purchases of British chemicals since last Autumn, culminating in October in sales worth £691,517.

Synthetic Fibres

AN appeal for greater research and investigation of synthetic fibres and a survey of their impact on the textile industry was made by Mr. J. G. Evans, chief chemist of the Bradford Dyers' Association, in an address to the Royal Institute of Chemistry and the Society of Dyers and Colourists last week. Greater use of synthetic fibres as a means of curbing the rising cost of living has been put forward in several public pronouncements recently, but Mr. Evans rightly emphasised that although there remain some thousands of man-made fibres still to be examined, there was bound to be an inevitable time-lag between the scientific discovery and its application in industry. Evaluation of synthetic fibres was more often than not a lengthy and costly procedure. Nylon was said to have cost the Du Pont company $27 m. Another problem for the textile industry was that of devising plant for the new fibres which presented their own special problems and a great opportunity to re-design machinery. Dyeing was another matter where existing methods might have to be discarded in order to grapple with an unorthodox approach. The only new fibre to be manufactured in the near future is Ardil, which is expected to be in quantity production next year. It would seem therefore that any early relief to living costs from the application of synthetic fibres to the textile industry can be discounted.

Less Sulphur in 1951

FIFTY years ago Frasch perfected his "hot-water" process of mining sulphur. At that time the U.S.A. was importing about 170,000 tons of brimstone every year. To-day the U.S.A. exports over eight times that tonnage. In 1900, the U.S. annual production of sulphuric acid was about one million tons, made by the chamber process. Now, in 1950, it is over 12 million tons, and about three-quarters of all U.S. sulphuric acid is made by the improved contact process. These significant figures give an indication of the vast expansion of the U.S. sulphur industry in the last fifty years. No less important, however, is the impact that the development of the American sulphur industry has had upon the U.S. chemical industries in particular and those of the world in general. New uses for sulphur and its derivatives are continually being found and provide to a great extent the necessity for the enormous current production. The widening uses of sulphur derivatives in organic synthesis, for example, and war requirements of sulphuric acid are absorbing large portions of U.S. sulphur production, and these outlets seem likely to continue large for a long time. With ever increasing know-

ledge regarding the function of metabolism and disease there is a strong possibility of a still greater pharmaceutical demand for sulphur. Contemplation of future requirements only serves to aggravate the fear current in the U.S.A. that the indigenous supply is likely soon to be inadequate. Only the discovery of fresh deposits can completely solve that problem and, meanwhile America's customers and especially this country seem destined to go very short. An informed comment on the British situation this week suggests that the sulphuric acid industry will be lucky if it receives next year 50 per cent of its present sulphur supplies.

Cities Without Smoke

TWO circumstances seem predominantly to characterise what is loosely termed " the smoke problem " —that it is well nigh intolerable and yet incurable in present conditions of society. Whatever can be done to mitigate the conditions in which in some of the worst industrial centres up to 2000 tons per acre of solids alone may be deposited by the chimneys will certainly not be forwarded by evading the facts, unpalatable though they are. How solidly entrenched are the conditions which make a varying amount of " smog " a normal winter state in most British cities was made very clear in the course of the paper which Dr. Albert Parker presented before the Royal Society of Arts in London on Wednesday. In this, the director of the DSIR Fuel Research Station incidentally disposed of a popular fiction of uninformed propaganda—that if all industrial chimneys were bereft of smoke " cities without smoke " would become a reality. The factor which chiefly determines the production of noxious—and wasteful—by-products of coal combustion is the efficiency, or the reverse, of grates and fire boxes and of stoking. Every good industrial boilerman knows that, but not the stoker of the domestic fire. If all the industrial coal burners were brought to a state of perfection, at a capital cost which would bear comparison with the Chancellor of Exchequer's figures, the much more numerous domestic chimneys would still emit by far the largest contribution of atmospheric smoke, about 900,000 tons each year. The emission from coke ovens and gas industry, of which Dr. Parker gave convincing statistical evidence, is by comparison trivial and the general run of industrial chimneys is responsible only for about 700,000 tons. Domestic grates are also the second largest sources of the destructive sulphur oxide fumes. The fuel expert's clear exposition of the relative responsibilities for the continuance of the smoke problem does not encourage slackening of any practicable steps to minimise the flow from the smoke stacks when they are not impossibly costly; but it disposes of idle dreams of banishing overnight the problem upon which committees have been cogitating since 1819.

Ancestors of an Industry

WHILE some of the associations in chemical industry are making a tentative approach to providing a public information service, I.C.I., Ltd., has just completed an independent programme which may have afforded to some million people outside the industry a decorative and memorable introduction to the background of current achievement. This was the series of advertisements " Ancestors of an Industry," which has now deservedly been given permanent existence in book form. These advertisements told the story of British scientific achievement from Robert of Chester, the English monk who in 1144 opened to the West the door of Eastern chemical knowledge, up through the centuries to Sir William Bragg and Lord Rutherford. The volume, excellently produced by the Kynoch Press, was prepared with the assistance of Dr. E. J. Holmyard, editor of *Endeavour*. Nearly all the illustrations have been based on contemporary portraits. It is to be hoped that I.C.I. will be able to make this series of biographical sketches widely available. There is no doubt that, as the introduction suggests, it will serve to remind people, both at home and overseas, that though scientific discovery knows no national frontiers, Britain's contribution to the progress of science is second to none.

SULPHUR SUPPLIES ENDANGERED

Uncertainty About U.S. Shipments in 1951

THE insecurity of British sulphur supplies next year has been underlined by the adoption in the U.S.A. of the principle of substantially reducing sulphur exports in the interests of the rising scale of home demand and of strategic considerations, undeterred by the large increases in the production of American sulphur. (THE CHEMICAL AGE, 63, 674).

In the first nine months of this year practically all the sulphur imported here —346,078 tons out of 346,194 tons—came from the U.S.A., and of last month's total of 36,227 tons all but 87 tons came from the same source. While no definite figure has yet been given to the extent of the intended reduction of U.S. exports, knowledgeable sources here believe it is possible that next year's sulphur shipments to Europe as a whole may be less than this country alone is using.

The amount Great Britain is to receive is still problematical, but a reduction of 50 per cent of the present imports seems not unlikely. The exports of sulphur from U.S., which total about 10 per cent of production have, in the past, been sufficient to enable the British sulphuric acid industry to meet all its requirements. But the vendors of sulphur have now been entirely deprived of control of sulphur supplies. The amount of sulphur that Europe will receive next year will be determined by the U.S. Government.

No one in Britain knows what will happen next year, and there may, in fact, be a gap in British sulphur supplies due to the changed circumstances. No shipments of sulphur have so far been allocated for January, 1951.

There is no simple means of overcoming the present difficulties. The alternative methods of producing sulphuric acid from pyrites and anhydrite, if introduced on a large scale, would prove an additional economic burden. The cost of producing sulphuric acid by these methods is, in the case of pyrites, about three times as great as by the conventional processes, while the anhydrite method costs about six times as much. The conversion or re-equipping of standard plants for these new methods would be a long and costly business. Apart from the very large capital expenditure involved there are the additional difficulties of finding sites for building and of providing the necessary materials, etc. If the reduction in acid supply is considerable, the effect upon British economic recovery will be widespread.

Supplementing supplies from abroad by recovering sulphur from coal or coke burning, for example, is not at present commercially practicable. Although British coal contains about 1.5 per cent of sulphur, on combustion most of this is converted to gaseous sulphur dioxide. The production of sulphur from such SO_2 would entail bringing vast volumes of the gas into intimate contact with some reagent which will quickly dissolve or combine with the SO_2 to give a product readily separable from the gas.

Precautionary Rationing of Basic Solvent Supplies

THE possibility of a serious shortfall in supplies of a material of basic importance to many chemical and process industries, arising from current conservation policy in the U.S.A., is foreshadowed in a statement issued this week by British Industrial Solvents, Ltd. This says that continued supplies of isopropanol from the U.S.A., on which the majority of acetone production in this country is at present based, have become most uncertain, owing to the effect of the Korean war on American domestic requirements.

All possible pressure is being brought to bear, states B.I.S., to ensure that supplies are maintained until production is available from the B.I.S. associate company's isopropanol plant at Grangemouth, which is expected early next year.

Until the position is clarified B.I.S. will be obliged, as a precautionary measure, to make a severe reduction in deliveries of acetone, to avoid the disastrous consequences of almost complete cessation of supplies in the first quarter of 1951. This will be done by limiting all deliveries from December 1 onwards to the monthly rate of approximately 60 per cent of the average monthly quantity purchased during the six months April/September 1950. It will not be possible to deliver supplementary quantities between now and December 1.

PRECIOUS METAL RESEARCH

Chemical and Metallurgical Aspects

THE wide range of activities of the Design and Research Centre for the Gold, Silver and Jewellery industries, since its inception in 1946, was illustrated this week in a display in the new exhibition room, Goldsmiths' Hall, London.

Among the research exhibits was a panel devoted to the problem of firestain in silver, its scientific explanation and research for a remedy. It was found that if one per cent of aluminium was included in the sterling silver, oxidation formed a surface layer of aluminium oxide which stopped the deeper penetration of oxygen.

In the metallurgical laboratory were demonstrations of temper hardening of sterling silver, preparation of specimens for microscopical examination and the hardness testing of metals, the vacuum evaporation of metals (aluminium, etc.), by heating a tungsten filament in a bell jar for the embellishment of a number of materials, including plastics.

Tarnish-resisting wrapping cloth, the beryllia filming method of preventing tarnish, and the difficulties of establishing the proposed standard for the weight of silver plate on EPNS articles formed the main subjects in the chemical laboratory displays.

Examples of the development programme in the research office included demonstrations of the production of costume jewellery by the direct casting of low melting alloys into rubber moulds and the subsequent polishing, plating and finishing. Another section was devoted to what comprises a good polish, methods of measuring it, and how labour can be reduced by mechanised methods.

U.K.-U.S. Molasses Deal

BRITISH and American interests have contracted to buy the whole of Cuba's 1951 exportable supply of blackstrap molasses, at a price of 20 cents a gal. This compares with an average of five to six cents per gal. paid this year. Cuban production of blackstrap molasses in 1951 is expected to amount to 300 million gallons, of which 140 million gallons have be sold to American buyers and 50 million gallons to British buyers. The remaining 110 million gallons will be retained in Cuba to satisfy domestic needs.

Blackstrap molasses is important in the explosives and synthetic rubber. manufacture of alcohol and indirectly of

POWELL DUFFRYN NOTICES

Half a Laboratory Staff 'Redundant'

MORE than half the scientific staff of the Powell Duffryn research laboratories, Battersea, are stated to have received dismissal notices last week-end. This was disclosed at a meeting of staff on Monday at the headquarters of the Association of Scientific Workers.

Mr. J. K. Dutton, southern regional organiser of the association, to which members of the Battersea staff belong, said after the meeting that those declared redundant had received the exact length of notice to which they were legally entitled. The union considered that this action imposed hardship on its members. It meant that a large number of men specialising in the same subject and living in a small area would have to look for work at the same time.

After the list of dismissed scientists had been considered, the general opinion of the meeting was that those asked to continue work at Hayes (THE CHEMICAL AGE, 63, 674) represented a fair cross section of the staff. A letter has been sent to the management asking them to reconsider their decision.

Polystyrene for Australia

MONSANTO Chemicals (Australia), Ltd., is shortly to start building a £A.250,000 plant to manufacture Lustrex polystyrene. The first in Australia, the plant will be at Monsanto's Melbourne factory, and will ultimately be large enough to satisfy all Australian requirements.

The use of polystyrene by the Australian plastics industry has so far been limited because it has been available only from North America. The Australian plant and the recently completed plant of Monsanto Chemicals, Ltd., at Newport, Monmouthshire, will ensure adequate supplies of Lustrex in the sterling area.

The design of the plant is based upon information supplied by the associated Monsanto Company in the U.S.A., and the process will involve the conversion of styrene monomer to polystyrene suitable for moulding. Styrene monomer will be imported from the rebuilt Monsanto Texas City plant. Production of styrene monomer is also planned in Great Britain.

Swiss Dyestuffs for Russia

The value of Swiss dyestuffs exports to the U.S.S.R. shrank to Fr. 70,000 in the first half of the year compared with Fr. 1,425,000 in six months of 1949.

ANOTHER CHEMICAL EXPORT RECORD

October Total Approaches £10.6 Million

THE October total value of chemical exports, including drugs, dyes and colours, at £10,599,994 constituted a new high record. It was £397,433 more than the September record of £10,202,561 and contrasted arrestingly with the October, 1949, total of £7,640,808. Some outstanding values in October (the figure for the corresponding month of 1949 is shown in brackets) were: cresylic acid **£88,865** (£28,117); sulphate of alumina **£53,826** (£30,386); bleaching powder **£21,503** (£18,291); collodion cotton **£41,802** (£19,308); copper sulphate **£251,467** (£24,712); lead acetate £79,918 (£28,615); magnesium compounds £44,896 (£25,476); nickel salts £40,989 (£18,961); potassium compounds £108,066 (£47,553); salt £184,164 (£121,341); sodium carbonate £301,315 (£155,405); caustic soda £512,717 (£308,142).

Non-ferrous metals exports also showed some notable increases.

	Oct., 1950	Oct., 1949
	Gal.	Gal.
Cresylic acid	372,008	132,451
	Lb.	Lb.
Salicylic acid	96,862	169,694
Value of all other sorts of acid ...	£226,806	£137,749
	Tons	Tons
Sulphate of alumina	4,584	2,756
All other aluminium compounds	2,485	2,336
Ammonium sulphate	29,314	43,463
Ammonium nitrate	3,346	3,191
All other sorts of ammonium compounds	1,797	1,638
	Cwt.	Cwt.
Bleaching powder	18,975	13,568
All other bleaching materials ...	13,920	9,099
Collodion cotton	5,007	2,264
	Tons	Tons
Copper sulphate	4,655	649
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	46,832	55,603
	Tons	Tons
Fertilisers	2,106	1,786
Value of gases (compressed, liquid or solidified)	£29,605	£41,264
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	13,713	5,378
	Gal.	Gal.
Tetra-ethyl lead	89,334	122,937
	Tons	Tons
Magnesium compounds ...	1,132	520
	Cwt.	Cwt.
Nickel salts	6,611	4,041
Potassium compounds . .	11,716	4,923
	Tons	Tons
Salt	25,151	18,573
	Cwt.	Cwt.
Sodium carbonate	503,025	311,050
Caustic soda	449,664	271,344
Sodium silicate	28,708	33,117
Sodium sulphate	4,892	56,986
All other sodium compounds ...	88,536	91,177
	Gal.	Gal
Tar, creosote, anthracene oils ..	2,787,309	4,004,273
	Tons	Tons
Zinc oxide	1,593	1,442
Total value of chemical manufactures (excluding drugs and dyestuffs)	£6,146,088	£4,383,177
Value of quinine and quinine salts	£40,587	£21,259

	Oct., 1950	Oct., 1949
	Lb.	Lb.
Acetyl salicylic acid	211,913	156,201
	100 International Units	100 International Units
Insulin	706,224	1,060,645

	Mega Units	Mega Units
Penicillin	1,285,262	881,084
Total value of drugs, medicines and preparations	£2,164,622	£1,608,853
Total value of dyes and dyestuffs	£925,269	£663,682
Total value of paints, pigments and colours	£1,364,015	£985,096
Total value of chemicals, drugs, dyes and colours	£10,599,994	£7,640,808
Total value of all plastic materials	£929,246	£437,178
	Cwt.	Cwt.
Chemical glassware	1,299	1,240
Value	£50,028	£48,643
	Cwt.	Cwt.
Fans	3,564	5,703
Value	£99,693	£138,199
	Cwt.	Cwt.
Furnace plant	5,380	6,244
Value	£73,208	£85,446
	Cwt.	Cwt.
Gas and chemical machinery ...	18,289	26,565
Value	£208,647	£307,633
Value of scientific instruments (optical)	£79,995	£117,513
Value of thermometers, mercury-in-glass instruments, etc. ...	£43,635	£41,128
	Cwt.	Cwt.
Air and gas compressors and exhausters	13,409	10,083
Value	£284,991	£199,330
Non-ferrous Metals—	Cwt.	Cwt.
Aluminium and aluminium alloys	124,920	93,261
Value	£1,515,885	£1,061,807
	Lb.	Lb.
Bismuth metal (not including alloys)	66,918	25,086
Value	£49,588	£13,791
	Cwt.	Cwt.
Brass and other alloys of copper, other than nickel alloys	100,164	91,405
Value	£1,184,337	£863,127
	Tons	Tons
Copper	4,272	6,921
Value	£996,441	£1,087,185
	Tons	Tons
Lead, unwrought, sheets, etc.	585	297
Value	£91,860	£40,667
	Cwt.	Cwt.
Nickel and manufactures ...	12,032	23,369
Value	£235,046	£353,518
	Cwt.	Cwt.
Nickel alloys	3 305	2,633
Value	£69,737	£47,172
Value tin, unwrought ...	£925,115	£493,812
Value tungsten	£20,776	£26,047
Value zinc	£137,878	£49,007
Total value of non-ferrous metals group	£6,420,856	£5,177,045

OIL FROM COAL

£1 m. South African Company

A PUBLIC company to produce oil from coal has been registered in Pretoria with a nominal capital of £1 million. The formation of the company follows the recent announcement that the Government had decided to guarantee the financing of the project to the extent of £18 million (THE CHEMICAL AGE, *63*, 391). It will be known as the South African Coal, Oil and Gas Corporation, and its basic products will be crude petrol, diesel oil and certain quantities of gas.

The company has options on more than 600 million tons of coal, which is greater than the potential of the Witbank coalfields. In the initial stages, the company plans to produce 35 million gallons of petrol yearly for consumption in the interior. Matters of policy are still under consideration, but it was stated in Johannesburg by the vice-chairman of the company that the price of the petrol would be competitive. He said that fuel oil would probably not be produced from coal in South Africa for at least three years.

Mr. A Brink, technical manager of the Anglo-Alpha Cement Co., Ltd., has been appointed construction manager of this new oil-from-coal project. Mr. P. E. I. Rousseau, the managing director, is visiting Britain, Germany and France to carry our further investigations into coal-oil processes and gasification.

U.K. Total Still Inadequate

THE inability of the nationalised coal industry to sustain production at the level required by the growing requirements of United Kingdom industries and the small export trade was disclosed in the revelation this week by the Minister of Fuel that it would be necessary to buy overseas the equivalent of "part of one week's output." Weekly coal output has recently averaged rather less than 4.5 million tons. In his statement in the House of Commons Mr. Noel Baker said some of this coal would be bought from the U.S.A. to compensate for the fact that opencast output would fall short of the estimate by about 750,000 tons and deep-mined coal would not exceed the lower estimate of the last Economic Survey (205 million tons).

Although coal production last week was slightly larger than in the previous week, it was 86,100 tons less than in the corresponding week of last year. The total was 4,433,000 tons.

PLASTICS AND POLYMERS

Federation's Prize Scheme

PRIZES valued up to £150, for award in June 1951, are offered by the Council of the British Plastics Federation, as administrators of the Bowen (Cables and Plastics) Prize Fund.

The prizes (a maximum of three) will be awarded for suitable papers on scientific contributions in chemistry, chemical engineering, physics, or engineering, having a bearing on plastics or polymers. The papers should have been read during the period September 1950, to June 1951, before the Plastics Institute or its branches or the Plastics and Polymer Group of the Society of Chemical Industry, including the symposium or the convention held in connection with the British Plastics Exhibition in June next year.

Papers may be submitted direct without submission to any of the bodies. If a paper so forwarded has not already been published and qualifies for an award, it should be published in a suitable journal in agreement with the council of the British Plastics Federation.

The award of any prizes may be withheld if the papers submitted are not considered of a sufficiently high standard.

Contributions may be forwarded by the responsible councils or committees of the organisations concerned or may be forwarded direct by the author so as to reach the British Plastics Federation not later than Friday, June 29, 1951.

European Chemical Surpluses

THE possibility that Italy may have a disposable surplus of 80,000 metric tons of sulphur (and Belgium 500 tons) is indicated in the OEEC publication of lists of exportable surpluses of chemicals by European countries, a few copies of which reached the Board of Trade and trade associations this week. The figures show that in July this year Germany expected a monthly surplus of 110,000 metric tons of carbon black and France a total surplus of 10,000 metric tons of copper sulphate. Great Britain's two "ample" surpluses (no tonnages are quoted) were disinfectants, insecticides, etc., and arsenical acids. Adequate supplies included chlorine, ammonia, sodium, ammonium, zinc and aluminium chlorides, naphthalene and coal tar. Solid caustic soda and carbon black, nitric and phosphoric acids, hydrogen peroxide, certain grades of barium chloride and toluene were limited.

NEW SYNTHETIC FIBRES

Advantages of the Wide U.S. Research Policy

NOWHERE else in the world was the search for new synthetic fibres being so avidly and enthusiastically pursued as in the U.S.A., where the number of chemists engaged was far in excess of the total number in the whole of the British textile industry.

This point was made by Mr. J. G. Evans, chief chemist of the Bradford Dyers' Association, in an address to a joint meeting of the Yorkshire section of the SCI and the Society of Dyers and Colourists at Huddersfield last week.

In many aspects of new fibre development America was leaping ahead. Mr. Evans urged the need to start research on these new fibres at British universities and technical colleges in order that a new generation would enter the industry forearmed. Leeds, at present, was the only university in the country carrying out such research, but the effect was too small. He had no illusion that a man-made fibre approaching wool in all its potentialities was to be seen at present, but he believed it more than likely that several would be found whose properties would make them more suitable for what are now regarded as legitimate uses of wool. Quite irrespective of the price of wool, research into the production of synthetic fibres would continue, "even if wool was given away." It was inexorable progress; when the right fibres were produced they would be in regular production and steady in price.

In the opinion of Mr. Evans, the potential impact of the new fibres far transcended the already substantial contribution made by rayon. With some thousands of new synthetic fibres potentially available, the field was so large and chemists' experience in it only beginning; later technical advances would surely produce cheaper fibres of new technical merit.

Referring to Britain's position in this wider exploitation, there was (excluding Ardil), only one other fibre (apart from rayon and nylon) which had been announced in this country as being under development. This was Terylene, discovered by Whinfield and Jackson of Calico Printers' Association, Ltd., and now under development by I.C.I., Ltd., (THE CHEMICAL AGE, 63, 705). In the U.S.A., fibres in production, or announced as projected, included Saran (or Velon), Fibre V, Orlon, Vinyon N and Dynel polyethylene fibre, and Polyfibre.

Science Exhibition for the Blind

AN attempt to help blind and partially-blind people to understand some of the developments in modern industrial chemistry forms an important section of an exhibition opened last week at the Science Museum, South Kensington.

A pioneer exhibition of this kind was held last year and proved a great success. The present display is larger and better arranged. There are 100 exhibits so dispersed that each one can be touched by the visitors. Each item is also described in Braille on aluminium panels, while there are also labels in ordinary type.

In the chemical section examples of natural and synthetic fibres may be compared by "feel." The process of producing vanillin, the chemical principle of vanilla, from cloves is demonstrated in another exhibit.

Here another sense—that of smell—is brought into play. Each stage from the original clove to the final production of vanilla has its own distinctive odour. Touch amplifies the picture.

Pupils from the Chorley Wood College for Blind Girls comparing synthetic and natural fibres at the Science Museum exhibition, which remains open until December 10

ORGANIC PHOSPHORUS INSECTICIDES

A Survey of Recent German Investigations

SOME interesting details of German work on the use of organic phosphorus compounds as insecticides have recently been given by Dr. G. Schrader in *Angew. Chem.* (62, 20, 471-3).

The author, who has been engaged on this type of work since 1934, says that one of the first important results obtained was the discovery of organic phosphorus compounds with powerful insecticidal (contact) effect, without, however, also requiring the presence of fluorine in the molecule. These compounds were prepared by reacting dimethylamino-phosphoric dichloride with sodium acetate in the presence of dry alcohol. The method was patented in 1937.

TEPP

Structurally, the reaction consists in attaching an acid group to the central P atom, in addition to double bond oxygen and two like or different substituents (alkoxyl groups or the radicle of a secondary base). Several derivatives of pyrophosphoric acid were obtained by similar methods, including the tetraethyl ester. Patents were applied for this ester in 1938, but were held on the secret list by the Army authorities in 1939. A new synthesis of the ester, from *o,o,o*-triethylphosphate and diethylphosphoric dichloride, was included.

The tetraethyl ester is a strong poison for warm-blooded insects, and has remarkably strong contact even in 0.01 to 0.1 per cent dilution, against leaf lice of all kinds, red spider, caterpillars, etc. It is now usually called TEPP and was one of the German insecticides investigated by the Allied intelligence commissions in 1945. In its newest form it is much more stable in the presence of water.

By reacting a substituted phosphoric mono-chloride with the corresponding alkyl ester at high temperatures numerous pyrophosphoric esteramides and amides may be prepared. Full details of these are given. The nitrogen derivatives of TEPP are water-soluble, colourless liquids that may be completely distilled in vacuum (1-3 mm.). The subcutaneous toxic dose, according to G. Hecht, is 3-18 mg./kg. as sprays of 0.05-0.2 per cent dilution these derivatives are very effective against leaf and other pests.

A particularly interesting feature of this group, observed by the author and co-workers in 1939-1941, is that living plants absorb the active principle from the sprayed material through roots and leaves. After 3-4 weeks many of the usual kinds of insect pests visiting these plants are destroyed. This has since been confirmed by further research in other countries, and in England the preparation Pestox III has been made available commercially.

The reaction products of phosphorus oxychloride with triethyl phosphate comprise another group of insecticides, from which preparations of the Bladan type are obtained. A new insecticide under this name was first introduced in Germany in 1944, as an effective substitute for nicotine, and has since been the subject of extensive study. Its essential constituent is purophosphoric-tetraethyl ester. Commercially, a mixture containing up to 20 per cent of this ester is now available as HETP (hexaethyl-tetraphosphate). Hydrolysis of both HETP and TEPP has been studied by J. A. Ketelaar and A. H. Bloksma. Large scale production of Bladan has been investigated by W. H. Woodstock.

In order to obtain alkali- and water-stable preparations certain thiophosphoric compounds were studied. A satisfactory product appeared to have been found in dithio-pyrophosphoric-tetraethyl ester, as prepared by A. E. and B. A. Arbusov. This also is a very effective contact insecticide. According to Hecht the sub-cutaneous toxic dose for white mice is 8 mg./kg. Its insecticidal properties, however, seem to have been eclipsed by the more recently developed esters, E 600 (Mintacol) and E 605 (Parathion).

Laboratory Findings

The anhydrides in these compounds were investigated by the author and co-workers to determine whether those of phosphoric acid alone were effective or whether they should be supplemented with others of organic or inorganic acids. The products were tested in the Leverkusen Biological Inst. (H. Küthenthal). The *o,o*-diethyl-phosphoric-*o*-*p*-nitrophenyl ester was first prepared by reacting the sodium salt of *p*-nitrophenol with the chlorophosphoric diethyl ester. Later, direct nitration of the phosphoric-phenyl ester was employed.

The corresponding thio compound (Parathion) was prepared in 1944 by reaction of diethyl-thio-phosphoric monochloride with the sodium salt of *p*-nitrophenol. The ester is a yellow water-insoluble oil crystallising out at 6°C.

SELECTIVE SEPARATION OF XYLENES

*Commercial Possibilities in U.S. Method**

ALTHOUGH the xylene mixture distilled from coal tar has long been used as a commercial solvent, individual isomers have always been much more expensive to produce. Analyses of coal tar xylene and of xylenes from catalytic refining processes have shown all these xylenes to have similar compositions and to contain large amounts of ethyl benzene. Isomer separation has always been difficult because of the similar physical properties of this group.

For example, *o*-xylene, *p*-xylene *m*-xylene and ethyl benzene have boiling points of 144.4, 138.3, 139.1 and 136.2° C. respectively, and although *o*-xylene can now be separated from its isomers by fractional distillation, separation of the other isomers remains very difficult.

Previously, *m*-xylene has been separated by selective sulphonation, based on the principle that its rate of sulphonation is faster than the other isomers and that the rate of the hydrolysis of *m*-xylenesulphonic acid is faster than that of the other xylene-sulphonic acids. The separation of *p*-xylene has been accomplished by freezing but the existence of a *m,p*-xylene eutectic mixture limits the amount of *p*-xylene recoverable by this method.

Although various combinations of these methods have been successfully adapted to commercial scale production it is obvious that a cheaper and improved separation process would appreciably increase the demand for individual isomers. A hydrogen fluoride-boron trifluoride extraction process described in *Industrial and Engineering Chemistry* (42, *10*, 2103) gives promise of providing, in combination with other methods, a possible method for the separation of each of the xylene isomers in a high state of purity.

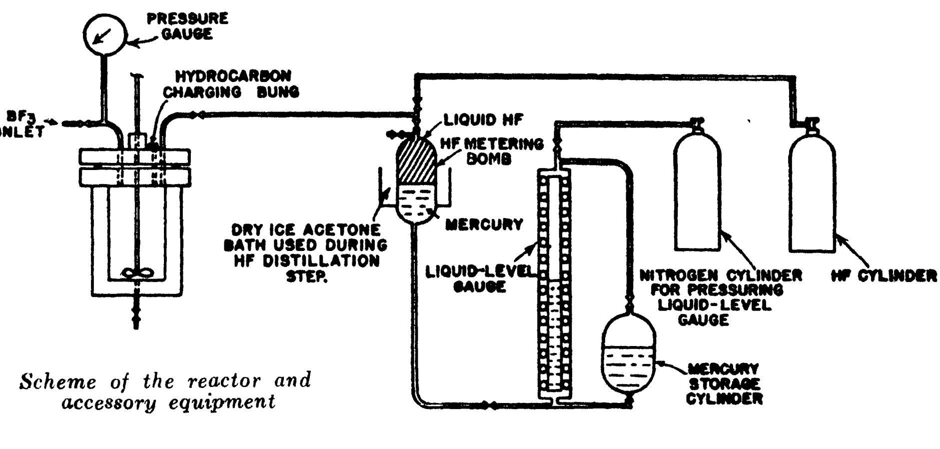
The two lines of research on the problem involved are these: (1) A series of batch extraction experiments, using HF-BF_3 on synthetic mixtures, to give quantitative separation data; (2) A series of vapour pressure measurements made on the three xylene-HF-BF_3 systems, to gain information about the selective solvent action.

Reagents Used

The HF and BF_3 used were commercial grades of 99.6 and 96 per cent purity, respectively. The 4 per cent impurity in the boron trifluoride consisted principally of an inert non-condensable gas. This was separated by evacuation from the BF_3, which was kept at liquid nitrogen temperatures during the pumping period.

The batch-extraction runs were carried out in a 1570-ml. carbon-steel autoclave fitted with a 1725-r.p.m. mechanical stirrer, shown in the diagram. The xylene mixture to be extracted was charged through an opening in the closure plate, after which liquid hydrogen fluoride was added from the metering bomb. The volume of hydrogen fluoride was measured by the amount of mercury displaced from the visual-type liquid-type gauge. (The

* A condensed abstract of an article appearing in "Industrial and Engineering Chemistry" (42, 10, 2103), by D. A. McCauley, B. H. Shoemaker and A. P. Lien of the Standard Oil Company (Indiana)



Scheme of the reactor and accessory equipment

hydrogen fluoride was charged originally to the metering bomb by distillation from a commercial 100-lb. cylinder.)

Boron trifluoride was charged under pressure into the reactor through a valve on the line to the pressure gauge from a small cylinder, which was weighed before and after addition. After the boron trifluoride had been added the mixture was stirred for about 15 minutes at 20° to 25° C. and allowed to settle for another 15 minutes. The acid phase was withdrawn from the bottom of the reactor into a dry ice-cooled flask after which the hydrocarbon phase was removed and washed with ammonium hydroxide to remove traces of dissolved hydrogen fluoride and boron trifluoride.

The extracted xylenes were recovered from the acid phase by displacement with water. About 300 gm. of water were added slowly to the extract-containing copper flask immersed in dry ice-acetone.

Fractionation

After all the water was added, the flask was shaken until it reached room temperature. The contents were then transferred to a copper separating funnel, where the supernatant hydrocarbon was separated from the lower aqueous acid phase. This method was used because of its simplicity, although other experiments showed that the components of the extract phase could be readily separated by distilling the boron trifluoride and hydrogen fluoride from the hydrocarbon.

The hydrocarbon extracts and raffinates of all runs were fractionated on a column of 30 theoretical plates, and the C_8 alkylbenzene fraction of each was analysed by the ultraviolet-absorption technique.

A comparison of the raffinate and extract compositions for all four runs showed that *m*-xylene is selectively extracted by the hydrogen fluoride and boron trifluoride mixture.

In the study of vapour pressure measurements weighed amounts of hydrogen fluoride and hydrocarbon (about five moles of hydrogen fluoride and 0.4 mole of xylene) were introduced into a flask. The flask was attached to the vacuum system, its contents frozen in liquid nitrogen, and the whole system evacuated. The valve to the flask was closed and boron trifluoride gas was passed into the system and allowed to fill the calibrated metering flask to a definite pressure. The valve of the vapour-pressure measuring flask was opened and the boron trifluoride was condensed in this flask.

After several increments were added in this manner, the valve of the metering flask was closed and the vapour-pressure flask was allowed to warm to 0° C. in an ice bath. The flask was agitated by hand at this temperature until a constant pressure was reached; this usually required from one to two hours. After this reading was taken the contents of the flask were again frozen in liquid nitrogen and another increment of boron trifluoride was added.

This cycle was repeated until the partial pressure of boron trifluoride in equilibrium with each liquid phase had reached about 150 cm. of mercury, which is the safe working-pressure limit.

The reaction rate between xylene, hydrogen fluoride, and boron trifluoride is extremely rapid. In all the runs, hydrogen fluoride and xylene were charged to the reactor and boron trifluoride was then added under pressure above the liquid, so that three distinct phases were present: a bottom liquid hydrogen fluoride layer; a middle xylene layer; and a top layer of gaseous boron trifluoride under about 30 to 40 atmospheres pressure.

As soon as the mixture was stirred, an immediate drop in pressure to zero indicated an almost instantaneous reaction between the three components. It appears, therefore, that the rate of action is governed only by the rate of mixing of the three components.

From considerations of this work it is evident that the reactions involved are sufficiently rapid and selective. Ninety-five per cent *m*-xylene can be separated from mixed C_8 alkylbenzenes in a counter-current extraction tower of four or five theoretical plates. The use of an inert hydrocarbon diluent such as a light naphtha or petroleum ether further improves the extraction selectivity by reducing the amount of xylene "physically" dissolved in the acid layer.

Separation From Complex

The extracted *m*-xylene may be recovered from its complex by vaporising the derived hydrogen fluoride and boron trifluoride at moderately low temperatures —for example, 40° to 70° C. If the process is carried out on a small scale where recovery of reagents is unimportant, the *m*-xylene may be separated by diluting the complex with water.

Ethylbenzene may be separated from the remaining C_8 aromatics merely by adding, in the presence of an inert hydrocarbon solvent such as petroleum ether, enough boron trifluoride at a sufficiently high pressure to combine with all of the xylenes. In these conditions all the xylenes will dissolve in the acid phase and the ethylbenzene will either remain in the hydrocarbon layer or will be converted into benzene and C_{10} aromatics, which boil well outside the xylene range.

DRYING OILS FOR PAINT INDUSTRY

Consideration of Substitutes for Linseed

FOLLOWING an improvement in supplies, the official allocation of linseed oil to the paint and other industries in this country was discontinued as from July 2 (THE CHEMICAL AGE 62, 882). Severe shortage of supplies experienced earlier had, however, stimulated interest in the numerous other types of oils which might be used, leading to the initiation of discussions between representatives of the three paint trade associations—the National Paint Federation, the Paint Manufacturers' and Allied Trades' Association and the Society of British Paint Manufacturers—and the DSIR and the Board of Trade.

The views contributed by the paint industry have been summarised in the *Board of Trade Journal* (*159*, 771-3) which includes the following information.

The "bulk" oils at present in use by the paint industry in this country are linseed oil, tung oil and castor oil, while the main smaller quantity oils are stillingia, tobacco seed and oiticica oil. Soyabean oil is used on a large scale in the United States, but due to lack of supplies and shortage of dollars it has not been available, except experimentally, to paint firms in this country.

The total annual use of paint oils in the United Kingdom during the last year or two has been about 62,000 tons, made up roughly of 48,000 tons of linseed oil, 8000 tons of tung oil, 3500 tons castor and 2500 tons of stillingia, oiticica and tobacco seed oil taken together. The total consumption, it is expected, will gradually increase in line with general industrial production, etc.

Sources of Linseed Oil

Linseed oil, the most extensively used paint oil, has recently come mainly from Argentina and Uruguay. This is in sharp contrast to the position before the war. In the years 1936-38, about 70 per cent by value of our imports of linseed and linseed oil came from India, and 17 per cent from Argentina (imports from India and Argentina were almost entirely linseed, not oil). In the years 1947-49 only 15 per cent by value came from India and 75 per cent from Argentina (very largely oil). Some supplies have also been secured from Uruguay. India has now far less available for export.

Paint oils can be classified from the point of view of chemical constitution as: (a) Mainly linolenic rich oils, notably linseed; also stillingia and conophor. (b) Linoleic rich oils, *e.g.*, soya bean, sunflower, rubberseed, and tobacco seed. (c) Conjugated oils, *e.g.*, tung, oiticica. (d) Castor oil, which is in a special class.

Technical knowledge to-day is sufficient to admit a high degree of interchangeability of oils when subjected to suitable processing. Such processing may assume various forms and the future pattern of oil usage by the paint industry may well be such that the total quantity is more important than the relative amounts of each type. Such interchangeability has obvious advantages in meeting shortages of particular oils or fluctuations in price at any particular time. Nevertheless, linseed oil seems likely to remain the principal oil used by the paint industry.

No Complete Substitute

No oil, probably, could strictly be said to be a complete substitute for linseed oil, in the sense of having all its properties identical with those of linseed oil. Such studies as have so far been made suggest that conophor oil may come nearest to this requirement. Tests carried out on varnishes and paints made from this oil suggested that in practice it was likely to prove at least equal or even superior to linseed oil for many purposes. It was agreed by the group that it should command a price at least as high as linseed oil, and probably a higher price, for the relatively limited quantities likely to be available in the early stages of any commercial development.

Some 2000 tons of stillingia oil were imported into the U.K. in 1949, all from China. It is a valuable alternative to linseed oil and should, it is considered, normally command about the same price. The oils from rubberseed, soya bean and possibly sunflower would be useful to the paint industry and their value would be enhanced by fractionation, a process by which the drying status (as measured by iodine value) of a portion of the oil is raised, leaving a residue more suitable for other industrial purposes, or as a food oil.

Such tests as were carried out on two small consignments of candlenut oil from Fiji showed that it should prove useful as a drying oil. It has, in fact, been used for

some time in Australia and reports indicate that paints can be made in part from it equivalent to those based on linseed oil.

Tests made with tobacco seed oil showed that it is somewhat inferior to linseed oil, being slower in bodying and below linseed oil standards in weathering and water and alkali resistance. It is, however, a useful oil, which gives substantially better results in admixture with tung oil. A few hundred tons are already being used annually in the U.K.

No long-term problem is expected in the supply of conjugated oil, mainly tung oil, if the projects already started in Nyasaland are developed on the lines proposed. It is understood that in due course the output will reach 10,000 tons per annum, which is estimated to be sufficient for Great Britain's needs; but this is not likely to occur before 1965.

A very large variety of processes for treatment of paint oils is known and many are already used in this country. The paint industry representatives, however, feel that it is important that any new processes which make for greater flexibility in the treatment of drying oils should be at the service of the industry wherever they are likely to justify development in this country. This would permit a readier acceptance of a variety of feed stock oils, particularly linoleic oils such as soya bean, sunflower and rubberseed, even in relatively small parcels.

The process of solvent-fractionation, using either furfural or propane as the solvent, has been given considerable attention; it is a process which requires specialised plant and continuity of feed oil supply at a rate of some 15,000 tons per annum for economic working. Plant for such treatment is already operating in the United States but it is difficult to say whether in present conditions there would be sufficient supply and demand for such treated oils in the United Kingdom to make the project economically practicable.

Glass-Lined Equipment for Organic Preparations

GLASS-lined cast iron or mild steel reaction vessels, stirrers, stills and condensers were used by Mr. C. H. G. Hands and Mr. F. R. Whitt to demonstrate points in their paper on "The Use of Glass-lined Equipment in the Preparation of Organic Compounds", which they presented at the recent meeting of the North-Western branch of the Institution of Chemical Engineers, at the College of Technology, Manchester.

Graphited asbestos packings, said the authors, softened with machine oil, gave the least leakage of fluid from glands but routine operations under sub-or super-atmospheric pressure were impossible because of this leakage. Glass-lined cast iron pipes up to 6-in. diameter were used as distillation columns and, due to their large flanges, joints could be made tight enough for use at atmospheric or reduced pressures. Glass-lined double-surface condensers were used for refluxing or distillation work. The useful life of glass-lined vessels was affected as much by the thermal shocks received as by the corrosive nature of the acidic substances used.

In general, the vessels failed by cracking of the lining at a sharp radius, and stirrers, thermometer pockets and dip-legs had a shorter life than reaction vessels for this reason. Alternate heating and cooling caused cracks but pinhole leaks were the cause of few failures. Condensers failed mostly by pinholes and flaking at the vapour entrance. Heat transfer tests showed the high value of the resistance at the wall of the vessel. Oil heating was successful but electric trip heaters placed vertically on the walls of an oil-filled jacket caused the lining to be destroyed by excessive flaking.

Experimental determinations of jacket film heat transfer coefficients for Merrill oil, Dowtherm and tetracresyl silicate, formed the subject of a paper presented by Mr. E. Barton and Miss E. V. Williams. The properties and costs of the three materials were given. The heat transfer co-efficients were measured in a jacketed pan with the three fluids flowing in turn through the jacket, where the flow is neither turbulent nor streamline because of its distortion by convection currents.

The heat transfer fluids were pumped through the jacket by a gear pump and a liquid was contained in the pan. Coefficients were measured with liquid boiling in the pan and when the liquid was heated from cold. Due allowances were made for heat losses from the surfaces of the pan. As the Reynolds number for flow of the materials at the full annulus of the jacket was never more than 1000, the best correlation for such conditions was that of Colburn and Hougen, who supposed the velocities caused by thermal gradients had the predominant effect on heat transfer and that the resistance to heat flow should be determined by the temperature of the fluid and the temperature difference.

PROBLEMS OF SMOKE PREVENTION

Misuse of Coal May Cost £50 m. A Year

by ALBERT PARKER, C.B.E., D.Sc.*

GROSS contamination of the atmosphere in many towns is part of the price that has so far had to be paid for the development of industry, to enable this country to support a rapidly increasing population on a rising standard of living. Need we continue to pay this heavy price for progress, or is it practicable greatly to reduce atmospheric pollution, particularly that caused by smoke and grit?

In 1948, one of the most recent years for which statistics on coal consumption are available, the total inland consumption of coal, excluding coastwise bunkers, was 190 million tons. This amount was divided among the main broad uses as shown by the figures in the second column of the table.

Of the total of 190 million tons, which includes all the coal that gave rise to atmospheric pollution in this country, about 46 million tons, or rather less than one quarter, was carbonised in coke ovens, gas works, and low-temperature carbonisation plants to provide coke or solid smokeless fuel, gas, tar, motor spirit, fertilisers and raw materials for chemicals. The remainder, 144 million tons, was burned as raw coal with various efficiencies, and with the production of large quantities of smoke and other polluting substances. It included 37 million tons used in household grates, or about one fifth of the inland consumption of 190 million tons.

Pollution Estimates

The figures in the table show that the weight of carbonaceous and tarry matter in the smoke produced was 2 million tons a year. Roughly, one half of this smoke was derived from domestic grates, though they used only about one fifth of the coal consumed. The total pollution by oxides of sulphur was in the region of 5 million tons, and the weight of grit or ash discharged into the atmosphere was roughly 0.6 million tons.

The detrimental effects of pollution of the atmosphere by smoke, grit and oxides of sulphur from the use of coal are of many kinds. From estimates that have been attempted it seems that the money equivalent of the damage to buildings, equipment, fabrics, and agriculture, together with the direct waste of fuel in unburnt products, is at least £50 million a year, or an average of more than five shillings for each ton of coal used.

* Abstract of the paper, "Cities Without Smoke," which the director of the Fuel Research Station, DSIR, presented before the Royal Society of Arts in London on November 22.

MAIN USES OF COAL AND ESTIMATES OF POLLUTION IN GREAT BRITAIN IN 1948

Type and Use of Fuel	Quantity of coal: millions of tons per annum	Pollution Produced: million of tons per annum: Smoke	Ash	Sulphur dioxide*
Coal:				
Domestic use ...	37	0.9	0.1	0.9
Electricity generating stations	29	small	0.2	0.8
Railways ...	15	0.4	0 1	0.4
Other industrial uses	63	0.7	0.2	1.7
Coke and Gas:				
Coke ovens and use of coke ...	22	small	small	0.5
Gas industry:				
At gas works	24	small	small	0.1
Use of gas ...	—	nil	nil	small
Use of coke ...	—	nil	small	0.3
Totals	190	2.0	0.6	

* Reduced estimates based on comprehensive recent analyses.

On average, British coals and cokes made from them contain about 1.5 per cent of sulphur. Even with highly efficient boiler installations achieving complete combustion without unduly large quantities of air, the concentration of sulphur dioxide in the flue gas is ordinarily less than 0.1 per cent by volume. As the volume of flue gas produced for each ton of coal burned is in the region of 350,000 to 500,000 cu. ft., the volume discharged each day from a large power station using 2000 tons of coal a day is between 700 million and 1000 million cu. ft.

The problem of removal of sulphur dioxide, therefore, is one of bringing enormous volumes of gas into intimate contact with some solvent or reagent which will rapidly dissolve or react with the sulphur dioxide to give a solution or product easily separated from the gas. Further, the process must not give rise to an objectionable liquid or solid which cannot be disposed of without causing damage or nuisance, and the overall cost must not be too high.

The only processes that have been developed to the stage of application on a large scale are those that have been operated at the electricity generating stations at Battersea and Fulham. In the Battersea process, the flue gas is washed with Thames river water, and the solution so obtained is oxidised to convert the dissolved sulphite into sulphate. The water containing the sulphate is then discharged to the river.

The process, which removes 90 per cent of the sulphur, is dependent on having a large volume of water containing sufficient alkali to neutralise the acid oxide of sulphur, and on ensuring that the effluent does not unduly pollute the body of water into which it is discharged. About 35 tons of water are required for every ton of coal burned under the boilers, or about 15 million gallons a day for an installation using 2000 tons of coal a day.

There are very few sites in Great Britain where the necessary quantity of water could be obtained, and where the effluent could be discharged without serious difficulty. With new plant at present prices of labour and materials, the overall cost of the process is equivalent to adding about seven shillings to the cost of every ton of coal burned.

There is not yet any satisfactory method at reasonable cost of preventing pollution by oxides of sulphur from the combustion of coal and coke. For installations using very large quantities of coal, coke, and fuel oil, the effects of this pollution at or near ground level might to some extent be mitigated by judicious selection of fuels of low sulphur content, by careful selection of sites, and by discharging the gases through high chimneys.

There remain many problems requiring intensive scientific and technical investigation if satisfactory means of eliminating or very greatly reducing atmospheric pollution are to be found.

NAPT Reviews New Anti-TB Drugs

THE annual report for 1949-50 of the National Association for the Prevention of Tuberculosis states:—

"For many years we have been seeking a form of preventive inoculation which might help us with tuberculosis in a way similar to that in which vaccination has prevented smallpox and inoculation has controlled diphtheria. It is now some 40 years since Drs. Albert Calmette and Camille- Guérin introduced their vaccine against tuberculosis, usually known as BCG (Bacillus Calmette-Guérin). This vaccine has been used in many countries and at the end of 1949 was introduced into Great Britain. It is now administered to certain groups in the population who are what is called 'tuberculin negative': that is, whose reaction to a simple test shows that they are in need of protection. Among the groups usually chosen are those particularly in contact with tuberculosis, such as young children, nurses and medical students.

"BCG is given at chest clinics and dispensaries free of charge to those considered to need it. So far the method has had a happy reception by the people of this country, and we hope it will be extended in the future. BCG is safe and effective. It is a notable advance in our methods of controlling tuberculosis, and two leaflets on the subject have been published by the NAPT.

"Great hopes were entertained of the American drug streptomycin which has been used in both the United States and this country for several years. In its origin, streptomycin somewhat resembles penicillin, since both of them are made from common moulds which grow in the soil. Here, however, the resemblance ends. Streptomycin has by no means the wide powers of its great forerunner. Streptomycin is, in fact, a remedy for only a relatively few cases of tuberculosis.

"Still Experimental"

"Doctors are sometimes hard-pressed by their patients or patients' relatives to administer streptomycin without regard to the real nature of the case. But the decision in such a matter must be left entirely to the physician. In many cases streptomycin may be without value and may even do harm. The use of this drug is still at an experimental stage, and the NAPT issues a warning on the whole subject in the form of a short leaflet which has had an encouraging reception (What about Streptomycin? Leaflet No. 84).

"Another chemical compound called para-aminosalicylic acid, usually shortened to PAS, has given encouraging results and is now often combined with streptomycin."

The "Tuberculosis Index," now in its fifth year continues to give useful service by publishing lists of references to the subject in world medical and social literature, together with short abstracts of the more significant items.

FIGHTING LIQUID-FED FIRES

Powder Extinguisher Tests at Brentford

DRY chemical extinguishers for fires have been employed for at least 50 years, but recent times have shown an increased interest in new developments of powders, here and in the U.S.A.

Fires which offer the most difficult problems are those involving inflammable liquid. These were the subject of a demonstration at Brentford last week of a new CO_2 dry powder extinguisher (PD.20) designed by the Pyrene Co., Ltd.

The effectiveness of the extinguisher was shown in a series of tests dealing with fires originating in petrol, oils, alcohols and solvents. Six metal trays (4 ft. by 2 ft.) containing petrol, butanol, acetone, di-iso-butylene, toluol and iso-propyl-alcohol, were ignited and allowed to burn for approximately 30 seconds. All were extinguished with one extinguisher.

The average time to put out each was less than five seconds. Other tests included the extinction of a tray of burning methanol (7 ft. by 4 ft.), in about six seconds and a fuel oil fire covering 100 sq. ft.

Running petrol or solvents, which represent special difficulty, were also successfully dealt with in a final test. A drum of petrol was placed on the top of a wall and the liquid allowed to flow from ½ in. piping, spread over the ground, and was then ignited, and attacked with the extinguisher.

When the finely divided powder was sprayed at high velocity from a distance of about 15 ft. it tended to keep the flames down, but on the occasion of the tests there was no wind to contend with.

The propellant charge of the extinguisher is a heavy concentration of CO_2 which at the same time acts as a supplementary fire-fighting agent. The dry powder is claimed to be not toxic, abrasive, corrosive or conducting and is said not to cake in normal storage conditions.

[By courtesy of The Pyrene Co., Ltd.

The last of six fires being put out by the same extinguisher

The PD.20 extinguisher holds 20 lb. of dry powder in a container constructed to withstand a pressure of 600 p.s.i. A 300 lb. container for coping with inflammable liquids on a larger scale is at present in the course of construction.

This method of dealing with inflammable liquids would seem to be excellent for out-of-doors, but rather less suitable for dealing with interior conflagrations.

A smoke detector for use in the baggage compartment of aircraft was another Pyrene product demonstrated.

The Importance of the Technician in Industry

THE application of scientific analysis to modern industrial processes was the theme of an address given by Lord McGowan (chairman, I.C.I., Ltd.) at the annual prize-giving of the Royal Technical College, Glasgow, last Saturday. "On the technical side," he said, "we are continually developing new and better processes and improving old ones. We are applying the tool of scientific analysis to everything we undertake, including the detailed method of study of existing operations. The demand for large numbers of well qualified technical staff which this creates scarcely needs stressing."

Lord McGowan foresaw that when the rearmament programme developed we should find ourselves critically short of labour. This shortage would require increased productivity on the part of all.

Management must believe in, and seek for, continual progress. Its approach to progress must be dynamic. That referred not only to scientific and technical advance, but to human relations in all phases of industrial work.

FOAM SUPPRESSION OF PETROL FIRES

Comparative Studies by the DSIR

A COMPARATIVE study of the effectiveness of foam compounds on fires in petrol and certain industrial solvents, such as methylated spirit, is described in the latest DSIR publication on Fire Research.*

Experience has shown that existing recommendations on the minimum rate of application of foam to oil fires are sound, but that they cannot safely be applied to fires in certain industrial solvents that are miscible with water. In response to requests for advice from several quarters an experimental investigation of the problem was made.

Stabilised Foam

In the tests in the Fire Research Laboratories the rate of formation of a column of foam in contact with a solvent was determined under standard conditions. The method was not directly applicable to chemical foams; it was found, however, that if foams from compounds stabilised with saponin were collected and allowed to subside completely, the resultant liquid could be treated as an air-foam compound solution.

In comparing results of the various experiments the assumption was made that reconstitution does not affect the stability of the chemical foam; even so, whereas the water-miscible solvents reacted with keratin type air-foam solutions to give a gelatinous precipitate and to render them non-foaming, no such effect was observed with chemical foams.

Unfortunately the process of reconstruction could not be applied to all types of chemical foam and a simple alternative test of stability was therefore devised. Cylinders of foam were prepared and the rate of disappearance of the foam when floating on the surface of the solvent was measured. Industrial methylated spirit was chosen as representative of the water-soluble solvents, and tests were made on the pure solvent and in admixture with an equal volume of water. The results are given in the table.

In view of the small number of types of foam compound examined the report declines to draw general conclusions as to the superiority of chemical foam on petrol fires; one of the chemical foams examined was inferior to the hydrolysed keratin air foam.

Except the commercial product B, the stability of all types of foam was less over petrol than over water, and with all types of foam the stability was considerably less over industrial methylated spirit than over petrol. Dilution of the spirit with an equal volume of water produced a marked increase in stability of foam standing over the liquid.

STABILITY OF FOAM IN CONTACT WITH VARIOUS LIQUIDS (FLOTATION METHOD)

Foam	Time (sec.) for disappearance of half specimen (originally 4.6 cm thick) on: Water	Petrol	Industrial methylated spirit	50 per cent industrial methylated spirit and water
AIR FOAMS				
Hydrolysed keratin 3 per cent	600	150	1	
Soap 3 per cent	90	20	1½	1½
CHEMICAL FOAMS				
Laboratory preparation with saponin	225	210		
,, ,, ,, sulphate lye	120	60		
Commercial product A	1,260	540		
,, ,, B	180	180		

It was accordingly important to decide whether, as a practical procedure, the more rapid deterioration of foam over certain solvents could be allowed for by a higher rate of application, and if so, what this rate should be.

* Report of the Fire Research Board with the Report of the Director of Fire Research for the year 1949. DSIR and Fire Officers' Committee (HMSO 1s. 9d.).

Texas Oil Refinery Explosion

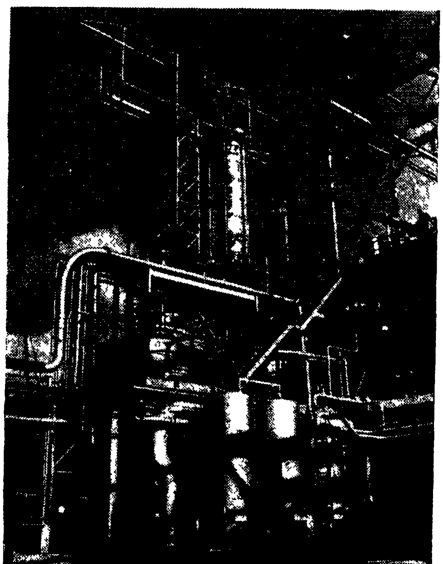
Seven explosions rocked an oil refinery near Port Arthur (Texas), on November 15. Three men were injured, one critically. The blast set off fires which were not extinguished until several hours later. The refinery belongs to the Gulf Oil Corporation, Houston. The explosion and fire began when escaping gas met a fire-box.

Technical Publications

THE development of petroleum refining in this country confers added interest on the summary of the economical creation by chemical engineers of the M. W. Kellogg Company in the U.S.A. of a surplus process unit into a modern lubricating oil plant. An important phase of the conversion, described and illustrated in the "Kelloggram" (No.4, 1950), was the phenol treating unit. Here, five towers in the former butane isomerisation section were converted directly into the five main towers of the phenol unit.

* * *

QUALITY products of Coalite and Chemical Products, Ltd., set out in a series of data sheets have now been issued in a compact folder for easy reference. Three information booklets also obtainable from the company's oil and chemical division deal with cresylic acids and high boiling tar acids (No. 200); pure mono-hydric and di-hydric phenols (No. 400); and the bactericidal activity of Coalite DXL high boiling tar acids compared with AFD cresylic acid (xylenols) (No. 600).



Already on stream at Shell Haven, six weeks ahead of the scheduled date, Shell Petroleum's new refinery is yielding petroleum and products at the rate of 1.45 million tons a year. Depicted here are the C4 and C5 columns of the new unit

FACTUAL information about raw and synthetic rubber, its production, consumption and industrial applications is contained in "Rubber" by A. F. Brazier (price 3s.) published by the Purchasing Officers' Association. This is one of a series of 17 booklets on raw materials intended to cover the syllabus of the association's final examination subject "Raw Materials (Economic and Geographical Survey)." Chemicals and fertilisers, natural and synthetic fibres are among the subjects of this series still to be issued.

* * *

QUICK selection of fans is provided for by the multi-rating tables set out in "Aerofoil Fans" (Publication No. V.1089) issued by Woods of Colchester, Ltd., an associate company of the G.E.C. The tables show at a glance the most suitable fans for any required duty within the capacities of the range. In most cases three or four alternatives are quoted, but for some duties there may be further alternatives, particulars of which can be had on application.

* * *

BIOLOGICAL purification of industrial waste waters is one of the researches described in the DSIR report "Water Pollution Research, 1949" (HMSO, 1s. 6d.). Other work discussed in the report includes an investigation into the effects of aeration on the composition of water and mechanical filtration of sewage effluents.

* * *

A NEW decarbonising solution for the removal of carbon deposits from all internal combustion engines is announced by Jenolite, Ltd., London. The solution operates at a temperature between 75° and 90° C. and the approximate period of immersion is 20 minutes. The process is non-corrosive and the fumes given off are harmless. The wearing of rubber gloves is recommended if the hands are constantly in contact with the solution, which tends to dry the skin.

* * *

FOR the practical execution of sampling inspection by unskilled factory personnel at its works in Holland, Philips have introduced a sampling table from which a suitable and efficient sampling plan can be easily derived for each particular case. The operation of such a plan is described by H. C. Hamaker, J. J. M. Tandin Chabot and F. G. Willemze in "Philips Technical Review" (Vol. II, No. 12).

EXPANSIONS IN CANADA

More Chlorine to be Produced

ABOUT $8 million will be spent by Marathon Paper Mills of Canada, Ltd., to expand its operations at Marathon, Ont. Included in the programme is the construction of a new chemical plant at Marathon for supplying chlorine and other chemicals used in bleaching pulp, and extra steam generating plant to increase the electric power capacity by one third. The new plant will produce 25 tons of chlorine and 27 tons of caustic soda every day, together with certain other chemicals. This will be sufficient to supply all the company's needs of chlorine.

$5m. for Ethylene

The president of Dominion Tar and Chemical Co., Ltd., Mr. A. H. Martin, has announced that the immediate construction of a plant in Montreal East has been authorised. The plant is to produce ethylene glycol and ethylene oxide. Approval has also been given for a substantial increase in the company's facilities for the manufacture of phthalic anhydride. The entire expansion programme will involve an expenditure in excess of $5 million.

The decision to enter the field of ethylene glycol manufacture was made only after several years of study. The project should fit particularly well into the company's over-all development programme.

Synthetic Detergents

Arrangements have been made to get the other principal raw material, ethylene, from the by-product gases of a major oil refinery in Montreal East. Process "know-how" has been obtained from a large U.S. producer of ethylene glycol. The principal use of ethylene glycol is in the manufacture of anti-freeze of the permanent type. Ethylene oxide is an essential raw material in the manufacture of synthetic detergents which are now being produced by one of Dominion Tar's associated companies.

The Diversey Corp. (Canada), Ltd., manufacturers of sanitation chemicals, has opened a new head office plant at Port Credit, Ontario. The administrative headquarters of the company was formerly at Toronto. The new plant covers 12 acres of ground and contains 20,000 square feet of floor space.

A feature of the new plant is a well-equipped laboratory for research.

U.S. BENZENE SHORTAGE

Production from Petroleum

AMONG the many schemes adopted to combat the shortage of petroleum is the so-called platform process—discovered by Dr. Vladimer Haensel and used to improve the quality of motor spirit—by which the Universal Oil Products Company, of Chicago, has begun commercial production of benzine from petroleum. It is understood that the company has developed facilities for the production of about 8 million gallons of benzine a year by this process. At the present time there is an acute shortage of ordinary benzene in the U.S.A.

The Monsanto and Dow companies are reported to have bought 15 million gallons of crude benzene for shipment to the U.S.A. in the next 12 months. This figure alone represents well over six times the amount of benzene imported by the U.S.A. from all sources during any post-war year, states the *Petroleum Times*. The British contractors are stated to be Stevinson, Hardy and Co., Ltd., and National Benzole Co., Ltd.

Directory of Canadian Chemicals

THE Dominion Bureau of Statistics has issued an 82-page directory of the chemical industries of Canada. The present volume, which is based on information available at the beginning of this year, contains an alphabetical list of chemicals and allied products made in Canada and the names and Canadian head office addresses of the firms which produce them.

The directory was compiled in response to frequent requests for complete lists of producers of the growing range of chemicals and chemical products now manufactured in Canada.

Detailed statistics of production, imports and exports of chemicals have not been included in the directory; separate reports of this kind are issued regularly by the Bureau. However, summary tables of the principal statistics—number of plants, employees, salaries and wages, cost of fuel and electricity, cost of materials, and gross value of products—have been included for chemicals and allied products and chemical processes.

High Output of U.S. Aluminium

Production of primary aluminium in the U.S.A. in the third quarter of 1950 was 871,945,743 lb. This was the highest total achieved since the second quarter of 1944.

OVERSEAS

Indian Manganese to U.S.A.

The U.S.A. imported 150,881 tons, nearly 80 per cent of the total of Indian manganese exports, between April and June, 1950.

Uranium for Gold-Bearing Ores

Representatives of the United Kingdom and United States Governments are at present in South Africa discussing with the Union authorities the production of uranium from gold-bearing ores. These discussions are a continuation of those held in the Union during November last year.

French Aluminium Output

A further increase in France's production of aluminium was shown in the October output of 5200 tons, compared with 4990 tons in the previous month. This brought production for the first 10 months of this year to a total of 51,000 tons, an increase of 4200 tons over the corresponding period of 1949.

New U.S. Source of Cresol

The use of *p*-cymene, an abundant constituent of pine oil, as a new material for *p*-cresol is reported from the U.S. The Hercules Powder Co., is operating a pilot plant process for peroxidising *p*-cymene to a methyl cumene hydroperoxide. This is then converted to acetone and *p*-cresol. The cost of the *p*-cresol made by this method is stated to be 50 cents a pound.

China Making Penicillin

On account of the leading U.S. penicillin producers and exporters being now unable to sell penicillin to China, as the greatest part of their current output is bought up by the U.S. Government, the Chinese authorities have established a penicillin plant in the neighbourhood of Hankow with a daily output capacity of 120 million units. The factory is stated to be equipped with U.S. plant.

Sweden Stops Iron-Ore Supplies

The Swedish authorities have ceased to issue export licences for supplies of iron ore to Western Germany. According to the Swedish Ministry of Foreign Affairs, this decision is due to the delay of shipment of West German coke which has seriously affected Sweden's supplies. German supplies of coke have been substantially reduced since October. Shipping difficulties are believed to have been partly responsible.

Norway's £600,000 Urea Factory

The Norske Hydro chemical organisation has completed its £600,000 factory at Heröya, South Norway, for the manufacture of urea. Full production has begun at the rate of 30 tons a day—equivalent to 10,000 tons a year.

Italian Schering Shares for Sale

The Italian Office of Enemy Property has offered for sale the entire share capital—20,000 shares—of the S.A. Italiana Prodotti Schering, Milan, the Italian subsidiary of the German Schering company. The minimum offer has been fixed at 700 million lire.

U.S. Steel Companies Merge

The U.S. Steel Corporation is to merge four of its largest subsidiaries in a single operating company on January 1, 1951. The four companies concerned are: U.S. Steel Corporation of Delaware, the Carnegie-Illinois Steel Corporation, the H. C. Frick Coke Co., and the U.S. Coal and Coke Co.

West Germany Producing Silicones

A West German chemical firm—Alexander Wacker, Ges. für Electrochemische Industrie, GmbH, Munich—has recently commenced the manufacture of silicones. The company is believed to be the first West German producer of this group of products. It is at present producing only liquid silicones but intends to produce the solid next spring.

Penicillin in Eastern Germany

The Madaus works in Radebeul, near Dresden, in the Eastern zone of Germany, is reported to have trebled its output of penicillin following the installation of additional tanks. The manufacture of penicillin tablets has started there recently, and the making of Vitamin D_2 in pure crystalline form was taken up some two months ago to utilise by-products from the manufacture of penicillin.

More Capital for Montecatini

The board of the Montecatini group is to recommend a meeting of shareholders on December 11 an increase of capital from 30 to 40 milliard lire by issuing 20 million shares of nominally 500 lire which are to be offered at par to present shareholders in the proportion of one new share to three old ones. Part of the money is needed to expedite the construction programme in respect of organic chemical products.

· PERSONAL ·

SIR FREDERICK BAIN (deputy chairman, I.C.I., Ltd.), has been elected an honorary member and honorary vice-president of the Association of British Chemical Manufacturers in recognition of his long and distinguished services to the association and the chemical industry. At the time when Sir Frederick would normally have been elected to the chair of the association, he was called upon to assume the presidency of the FBI. In view of his increasing responsibilities and commitments since that date, he has felt unable to undertake the additional responsibilities implied by the chairmanship of the ABCM. This appointment will enable him to retain his membership of the council and his close association with and support of the work it is doing for the chemical industry. MR. I. V. L. FERGUSSON (Evans Medical Supplies, Ltd.), and MR. W. J. WORBOYS (I.C.I., Ltd.), have been elected members of the council, and MR. J. L. HARVEY (Spencer, Chapman & Messel, Ltd.), has been invited to join the council as a co-opted member.

SIR FREDERICK BAIN, deputy chairman of I.C.I., Ltd., was taken ill at the farewell dinner party to the retiring U.S. Ambassador on November 14. He fell and injured three ribs, and was taken to hospital. His condition last Tuesday was stated to be improving.

Among the guests who will speak at the annual dinner of the Western Centre branch of the Institution of Incorporated Plant Engineers, in Bristol next Wednesday, are DR. H. J. GOUGH, engineer-in-chief of Lever Bros. and Unilever, Ltd., MR. E. G. PHILLIPS, president of the Institution, and MR. L. G. NORTHCROFT, joint managing director of Spirax Manufacturing Co., Ltd., and Sarco Thermostats, Ltd.

DR. W. GRAHAM KEYWORTH, plant pathologist of the East Malling Research Station, Kent, has arrived in the U.S.A. to spend a year as visiting scientist on the staff of the Connecticut Agricultural Experiment Station, at New Haven. He is particularly interested in the application of chemotherapeutic methods to the problems of plant diseases.

MR. A. H. MULDER, who recently completed 25 years' service with Philips Electrical, Ltd., has been appointed industrial manager for its Midland area.

The Pittsburgh Award for 1950 of the Pittsburgh section of the American Chemical Society—a bronze plaque which is awarded annually for outstanding service to chemistry—is to be presented on December 21 to DR. WILLIAM A. HAMOR, assistant director of the Mellon Institute of Industrial Research, University of Pittsburgh, Pa. He is, *inter alia,* a member of the scientific personnel committee of the U.S. Atomic Energy Commission.

On his retirement from the post of a technical adviser to the Vacuum Oil Co., Ltd., on the lubricating problems of the textile industry, MR. J. W. WARDROP last week was presented with a gift of electroplate at a dinner given by the directors at Bradford.

Royal Society Awards

THE King has approved the award of two Royal Medals for the current year on recommendations made by the council of the Royal Society.

Sir Edward Appleton, G.B.E., K.C.B., F.R.S., principal and vice-chancellor of Edinburgh University, is one recipient for his work on the transmission of electromagnetic waves round the earth and for his investigations of the ionic state of the upper atmosphere.

The other Royal Medal goes to Dr. C. F. A. Pantin, F.R.S., for his contributions to the comparative physiology of in invertibrata.

Further awards announced by the society are as follows:—

Sir James Chadwick, F.R.S., receives the Copley Medal for his work in nuclear physics and in the development of atomic energy, especially for his discovery of the neutron.

The Davy Medal is awarded to Sir John Simonsen, F.R.S., for his researches on the constitution of natural products, especially plant hydrocarbons and derivatives.

For his distinguished contributions to the study of algology Professor F. E. Fritsch, F.R.S., gains the Darwin Medal.

The Hughes Medal is awarded to Professor M. Born, F.R.S., for his contributions to theoretical physics and the development of quantum mechanics.

The pioneering contributions of Air Commodore Sir Frank Whittle, K.B.E., C.B., F.R.S., to the jet propulsion of aircraft are recognised by the award of the Rumford Medal.

· HOME ·

Wolfram Prices Raised

The price of wolfram ore quoted in London on November 20, showed an increase of 5s., at 255s. to 265s. per unit c.i.f. European ports.

Bulk-buying of Chrome Ore Ends

Centralised purchase of chrome ore which has been in force for 10 years ended on November 20, when Government bulk-buying and sale ceased and private trading was resumed. Import of chrome ore will be subject to import licensing regulations.

£1000 Pharmaceutical Scholarship

The Pharmaceutical Society has received £1000 on trust to establish a Humphreys Jones Scholarship in commemoration of the centenary year of the Liverpool School of Pharmacy and Mr. Humphreys Jones' association with the school for over 40 years.

Change of Address

Needing increased office space in London, Woods of Colchester, Ltd., fan manufacturers associated with the General Electric Co., Ltd., is moving the London offices on November 27 to 58-62 High Holborn, London, W.C.1. (Telephone: Chancery 5474/8.)

£1.5 m. Coke Oven Plant

A comprehensive coke oven and by-products recovery plant to be built at Fishburn Colliery in Durham has been ordered by the National Coal Board. With 50 coke ovens it will cost approximately £1.5 million and will carbonise 1000 tons of coal a day, providing blast furnace coke, tar, sulphate of ammonia, benzol and a bulk supply of gas for the Northern Gas Board. The contract has been placed with Woodall-Duckham Co., London.

New Training Centre Opened

Lord Citrine (chairman of the British Electricity Authority) on November 15 opened the employees' training centre which has been established by Lever Bros., Port Sunlight, Ltd., at the former Port Sunlight Hospital. The new headquarters will provide systematic training for all sections of the employees. Lord Citrine was accompanied by Mr. G. A. S. Nairn, chairman of Lever Bros. Port Sunlight undertaking, who invited Lord Citrine to unveil a memorial plaque.

A Five-Day Week

As from November 20, Ciba Laboratories, Ltd., has adopted a five-day week. Their offices and works at Horsham, Sussex, will accordingly be closed on Saturday mornings.

Scottish Seaweed Research

The Gulland Laboratory of the Scottish Seaweed Research Association, at Inveresk Gate, Musselburgh, was officially opened yesterday by Mr. Hector McNeil, M.P.

China Clay Council Formed

Following a recommendation of the China Clay Working Party, a representative council, to be known as the China Clay Council, has been set up for the industry to advise on methods of increasing efficiency and productivity. The chairman is Lt.-Col. E. H. W. Bolitho.

KID Exemptions

The following items are exempted from Key Industry Duty for the period November 22 to December 31 inclusive: Carbon tetrachloride; *p*-chloromononitrobenzene; *p* dichlorobenzene; 3 : 4-dimethyl-5- sulphanilamide-isooxazole; sodium trichlorophenoxide; *m*-5-xylenol; zinc ethylenebisdithiocarbamate.

Tin Recovers

After a setback at the beginning of the week, quotations for tin on the London Metal Exchange became easier. On November 17 cash tin was £1005-£1015 a ton, while three months changed hands at £949. On November 20, in the closing session there was cash business at £1050 a ton, and three months business had risen by £37 10s. to £985-£988.

U.K. Zinc Supplies

An immediate review of zinc allocations by the Government was being considered, according to a statement by Mr. G. R. Strauss, Minister of Supply, in the House of Commons on November 13. U.K. consumers are now allowed to purchase for delivery each month not more than nine-tenths of their average monthly consumption in 1949. Mr. Strauss said that the relative importance to the economy of different users of zinc and developments since 1949 should be considered. Some temporary adjustments to meet urgent cases had been made for this month.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

INDUSTRIAL PLATING & RESEARCH CO., LTD., London, E. (M., 25/11/1950). October 23, mortgage to National Provincial Bank, Ltd., charged on land and buildings to south of Cowley Mill Road, Uxbridge, with plant, fixtures, etc. *Nil. July 8, 1948.

Satisfaction

ERNEST H. KNAPE, LTD., Yelverton, chemists. (M.S., 25/11/1950). Satisfaction October 16, of mortgage registered October 28, 1949.

Company News

Change of Address

The address of L. Light & Co., Ltd., (organic chemicals) has been changed to Poyle Trading Estate, near Colnbrook, Bucks., where their new offices and stores were opened on November 20. The telephone number is Colnbrook 262/3.

Change of Name

The name of METRC CHEMICAL (ILFORD), LTD., of 15a Clarence Terrace, High Street, Barkingside, has been changed to METRO (ILFORD), LTD.

New Registrations

Amasal, Ltd.

Private company. (488,348). Capital £100. To acquire the undertakings of Stafford Salt and Alkali Co., Ltd., Geo. Hamlett and Sons, Ltd., Manger's Salt Works Ltd., Agden Salt Works, Ltd., and Alfred J. Thompson, Ltd.; and to carry on the business of salt proprietors and miners, etc. Subscribers: J. B. Gowman and C. J. Pollard. Solicitors: Clifford-Turner and Co., 11 Old Jewry, E.C.2.

John Dyer Trading Corporation, Ltd.

Private company. (27,987). Capital £1000. Chemists and druggists, etc. Directors: John Dyer, R. Simpson and D. D. Dyer. Reg. office: 807 West George Street, Glasgow, C.2.

Mangers Chemical Co., Ltd.

Private company. (488,428). Capital £100. To acquire the undertakings of (1) Shaka Salt & Chemical Co., Ltd., (2) Quickstryp Chemical Co., Ltd., (3) Mangers Garages, Ltd., and (4) May-Lyon, Ltd., and to carry on business of chemists, druggists, drysalters, oil and colour men and manufacturers of soaps, detergents, etc. Solicitors: Clifford Turner and Co., 11 Old Jewry, E.C.2.

John Shackleton (Chemicals), Ltd.

Private company. (488,256.) Capital £10,000. Objects: To acquire the business of chemical manufacturers and mechants carried on by C. Shackleton, G. D. Shackleton, E. B. Shackleton and S. E. Shackleton as "John Shackleton" at 2 and 4 Tamworth Street, Openshaw. Directors: C. Shackleton, G. D. Shackleton, E. B. Shackleton, E. Shackleton, A. Shackleton and W. Shackleton. Reg. office: 2 Tamworth Street, Openshaw, Manchester.

Stabilag-Company, Ltd.

Private company. (488,188.) Capital £3,000. Manufacturers and importers and exporters of scientific plant, instruments and appliances, etc. Directors: A. York, G. Jones. Reg. Office: 1 Broad Street Buildings, Liverpool Street, E.C.1.

Claim Against Aluminium Group

A CLAIM by Mr. R. H. Mackenzie against the British Aluminium Co., Ltd., for alleged damage to his house by fumes and dust from an aluminium factory at Burntisland was disallowed by Lord Sorn last week.

Reviewing the evidence, his Lordship said that it had not been proved that the condition of the paintwork was due to fumes from the works. While there might have been emissions of dust by overloading of the plants, or other technical reasons, it had not been material enough to amount to a nuisance. The position at Burntisland was not altogether satisfactory. Constant vigilance to minimise breakdown and overloading was required, but he thought the works manager was fully alive to this.

Chemical and Allied Stocks and Shares

BUSINESS in stock markets remained active, helped by a rally in British Funds, but main attention centred on industrials. Buying, however, was selective and focused chiefly on shares of companies considered to offer prospects of higher dividends. Dividend moderation, it is pointed out in the City, does not necessarily mean that payments should be restricted to the same rates as a year ago, when profits have advanced. The rise in costs and the prospect of still higher taxation next year would suggest, however, that many companies may face lower profits in 1951 and their shareholders, reduced dividends.

Even on the basis of unchanged dividends, many shares offer quite attractive yields at current prices, and, in general, industrials probably carry much less speculative risk than commodity and metal shares. It is expected, for example, that there will eventually be considerable falls in tin and rubber from the present exceptionally high levels.

Chemical shares were generally firm and where changed have moved in favour of holders. Imperial Chemical were up to 44s., helped by market confidence that the 10 per cent dividend will be maintained. Monsanto have been steady at 51s. Fisons, at 28s. 3d., held up well, there being a yield of 6¼ per cent on the basis of their 9 per cent dividend. Albright & Wilson were again 31s., with the new 5 per cent preference 22s. Laporte Chemicals 5s. units were 10s. 6d., with Brotherton 10s. shares active up to 21s. 4½d., while Boake Roberts were quoted at 35s. and Burt, Boulton & Haywood were 28s. 9d. F. W. Berk changed hands around 18s. and William Blythe 3s. shares held firm at 9s.

Turner & Newall at 87s. strengthened again, with the expectation that the dividend for the past financial year will be increased. United Molasses firmed up to 47s. The 4s. units of the Distillers Co. were up to 20s., with British Xylonite at 85s. 7½d. Kleemann 1s. shares were 9s. 7½d., and shares of companies connected with plastics also turned firmer on better trading reports. British Industrial Plastics 2s. shares were 6s. 6d. United Glass Bottle were 77s. 6d. Triplex Glass showed activity up to 28s., but later eased a little, although the market believes that there are prospects of higher dividends, especially since the doubling of output capacity at the Birmingham works is to be achieved without raising additional capital.

There was a firmer tendency among paint shares. Lewis Berger 4s. units at 84s. 4½d., and International Paint 4s. units at 16s. 6d., were both helped by the higher interim dividends. Associated Cement eased slightly to 81s. 3d., and British Plaster Board 5s. shares were 15s. 3d. British Oxygen were 88s. "ex rights" to the new shares. Dunlop Rubber have been active over 64s. on the new issue terms.

Glaxo Laboratories were active again up to 58s. 3d. The market believes that when more capital is required in due course this is likely to take the form of an offer of additional shares to shareholders at attractive terms.

Boots Drug have held steady at 50s. and Levers were 43s. 6d. More business was done in oil shares, but best levels were not held. Shell eased to 68s. 9d. after rising to 70s. Royal Dutch Oil shares were active although Paris reports of a share bonus were not confirmed. Apex Trinidad rose to 41s. 3d. on hopes of a higher dividend.

U.S. Curtails Trade with China

THE U.S. Department of Commerce, by control of exports, has withheld strategic materials from Communist China, although private traders have continued to receive valuable imports from China.

Announcing this recently, the U.S. Secretary of Commerce, Mr. Charles Sawyer, said that among the imports received by the U.S. from China were significant quantities of tungsten, tin and tung oil. By contrast, U.S. chemical exports have been sharply reduced, falling in value from \$18.7 million in 1948 to \$10.4 million in 1949 and to only \$1.1 million so far in 1950.

U.S. imports of tungsten from China in 1948 were 3,923,000 lb., increasing to 4,594,000 lb. in 1949 and, for the first six months of 1950, to the very high figure of 6,668,000 lb. U.S. imports of tin in 1948 were 3,641,000 lb.; in 1949, 8,206,000 lb., while in the first half of 1950 2,886,000 lb. were received. In 1949, 43 million lb. of tung oil were imported from China.

Mr. Sawyer stressed that, since January 1950, the U.S. has refused to issue export licences for aviation fuel, lubricating oil or diesel oil to Soviet-dominated countries.

Next Week's Events

MONDAY, NOVEMBER 27

Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. Film display.

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. (Meeting for registered students). Reading of original papers; films.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6.30 p.m. W. H. Glanville: "Road Safety and Road Research." First of three Cantor Lectures.

Institute of Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. E. Tunnicliffe: "The Continuous Vulcanisation of Rubber Cables."

TUESDAY, NOVEMBER 28

The Chemical Society

Belfast: Queen's University, 7.30 p.m. Dr. D. Entwistle: "Some Aspects of Cellulose Antoxidation."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 6.0 p.m. S. Robson: "Some Chemical Engineering Experiences in the Metallurgical and Chemical Industries."

Society of Instrument Technology

London: Manson House, Portland Place, W.1, 6.30 p.m. Dr. A. R. Boyle: "The Measurement of Viscosity."

Textile Institute

Edinburgh: North British Hotel, 7.30 p.m. Dr. B. P. Ridge: "The New Fibres."

WEDNESDAY, NOVEMBER 29

Royal Institute of Chemistry

Birmingham: University, Edmund Street, 6.30 p.m. Prof. H. W. Melville: "New Techniques for the Investigation of Chemical Reactivity."

Wealdstone: 2.0 p.m. Visit to Kodak, Ltd. (Registered students only).

British Association of Chemists

Liverpool: Radiant House, Bold Street, 7.0 p.m. Scientific film show.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 2.30 p.m. Lord Horder: "Cities Without Noise."

Fertiliser Society

London: Manson House, Portland Place, W.1, 2.30 p.m. Dr. A. B. Stewart: "Fertiliser Utilisation with Special Reference to Phosphate."

Institution of Electronics

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. G. Syke: "The Beta Ray Thickness Gauge."

THURSDAY, NOVEMBER 30

The Chemical Society

Sheffield: University, 5.30 p.m. Lecture by Prof. M. Stacey.

Institution of Mechanical Engineers

London: Storey's Gate, S.W.1, 10.0 a.m. "Joint Discussion on Heat Insulation." Four papers.

Association of Special Libraries and Information Bureaux

Leeds: Civic Hall. One day conference. Papers on "Libraries for the Study of Science and Technology."

FRIDAY, DECEMBER 1

The Chemical Society

Exeter: Washington Singer Laboratories, Prince of Wales Road, 5.0 p.m. (With RIC and SCI.) Dr. J. Grant: "Paper Making."

Glasgow: Beresford Hall, 6.45 p.m. Ramsay Chemical Dinner.

Manchester: Reynolds Hall, College of Technology 6.30 p.m. (With RIC and SCI.) K. Fearnside: "The Application of Radio-Active Isotopes in Industry."

St. Andrews: United College, 5.0 p.m. Dr. A. F. Coulson: "Micro Techniques in Chemistry."

Royal Institute of Chemistry

London: King's College, W.C.2, 5.15 p.m. Dr. A. J. B. Robertson: "Some General Problems in the Study of Reactions."

Aberdeen: Marischal College, 7.30 p.m. (With Chemical Society and SCI). E. J. Vaughan: "Instrumentation in Modern Methods of Analysis."

Manchester Statistical Society

Manchester: Albert Hall, Peter Street, 6.45 p.m. E. Lord: "How to Choose Between Alternative Statistical Methods."

SATURDAY, DECEMBER 2

Institution of Chemical Engineers

Manchester: Reynolds Hall, College of Technolgy, 3.0 p.m. G. U. Hopton: "The Associate Membership Examination."

Manchester Microscopical Society

Manchester: Geographical Society Buildings, St. Mary's Parsonage, 6.30 p.m. Annual Exhibition.

Prices of British Chemical Products

Dearer Sulphuric Acid, Glycerin and Lead Compounds

ACTIVE trading continues to be the keynote of the industrial chemicals market and most sections are reporting a persistent home demand. The volume of inquiry for shipment is also substantial but the scarcity of containers remains a serious impediment. The soda products and the general run of heavy chemicals are being called for up to the full extent of contracts and replacement bookings for 1951 are being actively sought. The increase in sulphuric acid prices has brought the cost of 140° Tw arsenic-free material to about £5 5s. 6d. per ton and the 168° Tw from £7 5s. 6d. to £8 5s. 6d. per ton. Timonox red star antimony oxide has risen to £222 10s. per ton for minimum 5 ton lots. A good demand, both on home and export account, is reported for most items in the coal tar products market and prices generally remain unchanged.

MANCHESTER.—Strong price conditions remained an outstanding feature of the Manchester market for heavy chemical products. Alkali and potash compounds were in steady demand in the home market. Replacement buying, however, was good in these as well as other products. Shippers' inquiries during the week have represented a fair bulk, while deliveries against home and export bookings have been on a substantial scale. There was a fairly steady movement in supplies of some of the fertiliser materials. Most tar products were in good demand.

GLASGOW.—Business in the Scottish heavy chemicals market continues to make steady progress and inquiries for chemicals and raw materials of every description are on an increasing scale. The main difficulty at the present time seems to be the cutting down of supplies available for the home market by export commitments. Exports have shown renewed activity but supplies are definitely slowing up.

Price Changes

Rises: Antimony oxide, citric acid, cream of tartar, glycerin, lead acetate, lead nitrate, red lead, orange lead, white lead, litharge, sodium acetate, sulphuric acid, tartaric acid, ammonium sulphate, carbolic acid, creosote, pitch.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £69; 80% pure, 1 ton, £74; commercial glacial 1 ton, £82; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £118 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 5d. per proof gallon; 5000 gal. lots, d/d, 2s. 6½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £47 per ton.

Ammonium Carbonate.—1 ton lots; MANCHESTER: Powder, £52 d/d.

Ammonium Chloride.—Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 2s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £179 10s. per ton.

Antimony Oxide.—£220 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4¾d. per lb. Crimson, 2s. 6½d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip.. 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£156 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£143 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Per lb., d/d buyers' premises, for 5 cwt. or over, anhydrous, 1s. 7d. plus 10 per cent, other, 1s. 7d.; 1 to 5 cwt., anhydrous 1s. 7½d. plus 10 per cent, other 1s. 7½d. Higher prices for smaller quantities. All subject to a trade discount of 5 per cent.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 2s. per lb.

Copper Chloride.—(63 per cent), d/d, 2s. 2d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63 per cent), d/d, 2s. 1d. per lb.

Copper Sulphate.—£60 2s. 6d. to £62 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £8 2s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £114 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1,260 s.g. 227s. 6d.—230s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—21s. per lb.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £85 per ton; dark tech., £75 per ton ex works; barrels returnable.

Lead Acetate.—White: £144 10s. per ton.

Lead Carbonate.—Nominal.

Lead Nitrate.—£126 10s. per ton.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £154; orange lead, £166. Ground in oil: red, £173 10s.; orange, £185 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £161 per ton. Ground in oil: English, under 2 tons, £177 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£154 per ton.

Lithium Carbonate.—7s. 9d. per lb net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £74 5s.; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £187; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 8s. 5d.; smaller quantities dearer

Mercurous Chloride.—9s. 4d. per lb., (28 lb. lots).

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 2d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 4d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1 ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £63 10s. per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iondide.—B.P., 15s. 5d. per lb. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £6 13s. to £7 13s. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s per ton; medium, £67 10s. per ton; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER: 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£49-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £29 12s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite. — Pea crystals £23 2s. 6d. a ton; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb, in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £7 5s. 6d. to £8 5s. 6d. per ton; 140° Tw., arsenic free £5 10s. per ton; 140° Tw., arsenious, £5 2s. 6d. per ton; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £9 5s. 1 cwt. lots £9 10s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d; white seal, £142; green seal, £141; red seal, £139 10s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5⅝d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £44 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 12s. 6d.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £20 4s.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works: 90's, 3s. 3d.; pure, 3s. 5½d.; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 1s. 1d. to 1s. 3d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 7d. to 10½d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal.; 99.5/100%, 3s. 11d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, American, duty free, 7s. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £9 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER: £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER: 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2½d. per gal. MANCHESTER: Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d, per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: November 22.—The following changes in the prices of unrefined oils are effective during the 4-week period ending December 2, 1950: Linseed oil, from £134 to £136 per ton; sunflower acid oil, soya acid oil and maize acid oil from £92 to £94 per ton. Prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers will remain unchanged. The prices of all refined oils and imported edible animal fats remain unchanged for the 8-week period ending December 2.

Monsanto's Sales Departments

IT is announced that as from Monday, November 20, the sales departments of Monsanto Chemicals, Ltd., for both home and export business are as follows:—

Allington House, Allington Street, London, S.W.1 (Victoria 8131), will deal with the General Chemicals Department which handles the following:—

Fine chemicals: salicylates, pharmaceuticals; heavy chemicals: cresols, phenols, preservatives, germicides and fungicides (including Permasans, Santobrite and Santophens), intermediates, phthalic and maleic anhydrides and all associated by-products; also detergents and related compounds, and textiles and agricultural chemicals.

Victoria Station House, Victoria Street, London, S.W.1 (VICtoria 2255), houses the following sales departments:—

Plastics (Lustrex, adhesives, plasticisers and resins), rubber chemicals; petroleum chemicals, Silicon (Organic) Developments, Ltd. (silicon esters, silicon tetrachloride, etc.).

Quicksilver Dearer

The price of quicksilver in London was raised by £1 15s on November 20. The new price is £31 15s. per flask.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

DESIGN ENGINEERS, with B.Sc. Degree in Mechanical Engineering or equivalent, and not over 40 years of age, are required by The Bahrein Petroleum Company, Limited. rience to have been in design of Oil Refineries, coal tar, chemical distillation or similar plants, involving electrical and steam systems, pressure vessels, fractionating columns, heat exchange and pumping equipment. Salaries according to qualifications and experience, plus kit allowance. Provident Fund. Free board and air-conditioned accommodation, medical attention. Low living costs. Two-year agreements with paid leaves and transportation. Write, giving full particulars of age, education and experience, to **Box 8785, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

EXPERIENCED ENGINEER with Degree standard in Mechanical, Heating or Chemical Engineering required as Technical Assistant by leading chemical engineering firm for design and calculations on heat transfer problems and also preparation of tenders, commissioning of plant and technical sales. Previous experience and proven ability in similar work essential. This is a permanent and progressive appointment. Residence in London area necessary. Write stating age, experience and salary expected to Box No. C.A. 2957, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

NORTH East firm of Chemical and Gas Plant Engineers require **DEPUTY to CHEMICAL RESEARCH MANAGER.** Good academic qualifications. Industrial experience desirable. Graduates in Physical Chemistry preferred, specialists in other lines would be considered. Post involves supervision as well as research and development work. Five day week, Pension Superannuation Scheme. Excellent prospects. Apply Box No. C.A. 2960, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

OIL Refinery Contractors handling large contracts for Refinery Plant, require **CONTRACT ENGINEERS** in their London Office. Duties involve broad direction and co-ordination of all phases of the work, including planning, drafting, purchasing, progressing and erection. Desirable qualification is previous experience of Refining Industry or Heavy Engineering, including a wide knowledge of pumping, heat-exchange equipment and instrumentation, and the appointment offers excellent prospects to suitable men. Applicants should write fully, stating qualifications, age and experience, to **Foster Wheeler, Ltd., 3, Ixworth Place, London, S.W.3.**

PLANT DEVELOPMENT AND PROCESS ENGINEERS, qualified in Chemical Engineering or Petroleum Refining Technology, required by Bahrein Petroleum Company, Limited. Age limit, 25-40. Two-year agreement periods with passages and paid leaves. Free air-conditioned accommodation, board and medical attention, kit allowance, low living costs. Salary according to experience. Write, with full particulars of age, education, experience, to **Box 3784, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

VACANCY for trained **ANALYST** to take charge of regular chemical analyses of water samples. Salary on (Provincial) Scales for Assistant Experimental Officer (man—£220-£460; woman—£220-£380), or Experimental Officer (man—£495-£645; woman—£405-£520) in Scientific Civil Service. Superannuation Scheme. Apply, with full details of age, experience and qualifications and the names of two referees, to the **Director, Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Westmoreland,** before December 31st, 1950.

SITUATIONS VACANT

ENGINEERS for the designing and operating of Continuous Tar Distillation and Ammonia Plants, required to take up permanent duties as soon as possible. Apply: **The Chemical Engineering & Wilton's Patent Furnace Co., Ltd. Horsham, Sussex.**

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Volume LXIII 2 December 1950 Number 1638

Industry's Coal Needs

THE incoherence and unpreparedness of national direction of the coal industry has again been painfully underlined by the recent revelations of the imminent return of shortages. The news, treading unceremoniously on the tranquil, though belated, 15-year "Plan for Coal" by the National Coal Board, has necessarily revived uncomfortable recollections of long periods of rationing and empty coal bunkers during the years immediately after the war. Then, lamentable confusion was produced soon after by vacillating Government policy to avert the worst consequences to industries, of which the large bulk producers of chemicals were conspicuous victims, of having failed to raise enough coal for domestic needs, industrial steam-raising and the coal converting retorts.

Having no policy giving any certainty that coal production could be increased to match the needs of reviving peace-time industries, the Government virtually joined in what was then called "the flight from coal" by strongly encouraging industries to undertake the costly conversion to oil burners. Many of those who accepted that recommendation had good reason to regret having placed confidence in the people whose authority should have been entirely reliable. Within a few months, it became clear that oil, like coal, would not be forthcoming on the scale the new plants would require.

All this, fortunately, belongs to the past. Yet the recollection of these things and in particular the losses of several thousand pounds incurred when the coal to oil conversion proved to have been no more efficacious than a charm to ward off fuel famine, does not permit any firm confidence in what is now being proposed. The "Plan for Coal" has no application to present problems; its first effects, should it be implemented, would not be felt until 1961. Meanwhile, mine production this year has failed so completely to fulfil the proposals for abundance, made at intervals since 1949, that the country has once more to resort to buying foreign coal—some admittedly for resale—and a hard winter might easily result in empty coal bunkers in the factories and more stringent rationing in the home. After nearly five years of plans and counter plans, the "coal problem" has proved by its vigorous reappearance that none of the specifics prescribed so far has done much more than to provide temporary relief.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

It would be unreasonably defeatist to condemn the latest addition to the "coal plans" as just another substitute for a satisfactory performance of the job of raising coal and getting it in sufficient quantity to where it is needed. It differs from some of its patchwork predecessors in proposing fundamental changes on the grand scale. It will involve the reconstruction of "probably over 250" of the 950 existing collieries to enable fewer miners to produce about 120 per cent of the present coal yield, and it will regrettably cost £635 million between now and 1965.

The efficacy of all this cannot be proved until ten or more years have passed. In the meantime the shortage is pressing, as near perhaps as the first months of 1951, and long-term planning is not an acceptable substitute for some means of securing full adequacy in present conditions. There is, in fact, at hand a means by which the recurrent deficiency between what industry needs and what it gets could be very greatly reduced. That could be done by making practicable some of the technical advances in coal using, about which so much is heard and so little done. All the experts have pleaded the need, and many have described the means, to save many millions of tons of coal each year by raising the efficiency of coal burning. The vast scope for improvement is suggested by the estimate—by the director of the Fuel Research Station—that average efficiency of utilisation of fuel and power resources here is well below 20 per cent. Industries' readiness to better that figure, and so reduce the mounting budget which material and labour costs continually inflate is not in doubt.

The Government's contribution to this very desirable end, apart from the money it allocates to the Fuel Research Station, has so far been trivial. Even more shortsightedly, it has doggedly retained the large purchase tax on full economising equipment. At last (on November 25) there is evidence, contained in the Minister of Fuel's mention of "a big fuel economy campaign", that an obvious need is to receive some attention. By facilitating the use of better coal burning equipment, and not only in factories, the Government could deprive the fuel problem of much of its sting—without waiting ten years, at a cost very much less than £635 million.

Notes and Comments

Limiting Acid Supplies

SULPHURIC acid is vital to the maintenance of a healthy economy of Great Britain. Few are likely to overlook that axiom—nor the fact that H_2SO_4 is becoming dangerously scarce. Considerable reductions have been made in the allocation of sulphuric acid, which affect all industries. Fertiliser manufacturers, however, have taken the severest cut. They now have to make shift with only half their former allocation. That is a double misfortune, because the producers of superphosphate could, in fact, have used more than they were actually getting at the time when restrictions were imposed. The effect of this reduction in the supply of sulphuric acid is that the output of superphosphate fertilisers in Great Britain is likely now to drop to 75 per cent of what was being produced a few months ago. As a remedy, the Government may have to buy superphosphate fertilisers abroad; not a very satisfactory alternative, particularly in view of present economic commitments.

No Way Out

BECAUSE the future supply of U.S. sulphur is problematical (THE CHEMICAL AGE, *63*, 737) there does not seem to be much hope of improving the supply of sulphuric acid to industry without resorting to the purchase of sulphur from other countries. Italy, from whom Great Britain bought a sizable quantity of Sicilian sulphur prior to 1939, is stated to have sulphur to sell. Some countries are buying it. But the price is said to be over twice as much as that of U.S. sulphur, and the quality to be rather inferior. In any case, it is doubtful whether the amount of Italian sulphur available would even assuage Great Britain's present pressing need. Only a quick appraisal of this country's difficulties by the U.S.A., followed by immediate action to permit an increase in allocations of sulphur can avert what promises to be an acute shortage of vital commodities—and not only superphosphate—early in 1951.

Sulphur—and Inflation

A PORTENT of what may be in store for British Chemical manufacturers next year should the threatened cut in sulphur imports, materialise is given in the announcement on November 24 by a leading chemical firm that " there has been a big increase in the price of lactic acid on account of the shortage of sulphuric acid." Thus, without being unduly pessimistic, it seems more than likely that, unless an adequate supply of sulphur is quickly made available to Great Britain in 1951, this notification of price increases is but the forerunner of many which must inevitably ensue from the shortage of such an important basic chemical as sulphuric acid. Coming at a time when the economic burden of Great Britain is already staggering, any increases in the costs of important chemicals will aggravate considerably the present upward trend in the cost of living index.

Plastic Films

IN 1939 Cellophane was freely available in the U.K. In 1950, British users are getting only a very limited amount and at a cost 75 per cent greater than pre-war. Orders for Cellophane are, in fact, being taken, but 12 months will elapse before delivery. While demand is, of course, much greater than production, this is not the main reason for the current stringency. British export policy appears to be the cause. The imperative national need for hard currency and dollars is forcing British manufacturers to sell most of their Cellophane abroad. Thus, the relatively small amount of Cellophane available for home consumption reflects another example of the sacrifice of British manufacturers' wants at the altar of economic expediency. But there is a brighter side. Alternative materials

are being developed which are finding great favour among those who wish to eke out their supply of Cellophane. The relatively new Pliofilm, processed by Goodyear from chlorinated rubber, is now being used in very large amounts. Recent expansion of production has, indeed, been unable to keep pace with demand. It was unfortunate that this boom should have occurred at a period when natural rubber is attaining price levels never normally approached in peace time—4s. 10d. per lb., which represents a three-fold increase over the immediate post-war price, and is five or six times greater than that of 1939. The price of chlorinated rubber film has fortunately not followed that of rubber to anything like the same extent. The shortage of Cellophane, like those of other "essentials", may, after all, have its consolations. Necessity is spurring British manufacturers to seek alternative materials. Pliofilm is one of the results of their research. It is possible that many other useful and novel stuffs may be developed as a consequence of the scarcity of conventional substances.

Father of Nuclear Physics

AN appeal for British scientists to support a fund to enable the work of Lord Rutherford to be adequately commemorated was launched by the Royal Society on St. Andrew's Day. Lord Rutherford, one of the greatest scientists of the 20th century, was born in New Zealand in 1871. He was awarded an 1851 Exhibition scholarship at Cambridge, where, under Sir J. J. Thomson, he was the first person to be accepted as an advanced student in work which permitted the granting of degrees of research. Lord Rutherford's investigations, which led to practically all that is now known of the structure of atoms, fell into three stages. He developed the theory of the atom in Montreal; the final convincing proof he provided at Manchester, and through his investigations of the structure of the nucleus itself, he founded in the Cavendish Laboratory, Cambridge, the modern science of nuclear physics. Men of the genius of Rutherford create by their achievements a memorial which lives after them, but nevertheless it is fitting that public homage should be paid to the memory of a great man, especially in some suitable method which helps others to continue his work. By his personality and leadership Lord Rutherford inspired others to achievements which they could not have reached alone. The proposed memorial by the Royal Society is to take two forms: Rutherford Scholarships tenable for three years, to be awarded to post-graduate students within the British Commonwealth, for research in the natural sciences with a preference for experimental physics; a scholar will normally be required to carry out his research in an institution in some part of the British Commonwealth other than that in which he graduated. A Rutherford Memorial Lecture to be delivered at intervals at selected university centres in the British Commonwealth overseas, at least one in three to be given in New Zealand. It is also proposed to arrange for the collection, arrangement and binding of copies of Rutherford's correspondence, and its preservation in safe custody for future reference. Such a scheme would indeed prove a worthy and enduring tribute to the "Father of Nuclear Physics" and deserves a generous support.

Scientific Council for South Africa

THE newly formed African scientific body, the Scientific Council for Africa South of the Sahara, is composed of 18 scientists from the United Kingdom and the Colonies, South Africa, Southern Rhodesia, France, Belgium and Portugal.

Dr. E. B. Worthington has been appointed secretary-general and the United Kingdom will be represented by Sir Alexander Carr-Saunders, chairman of the Colonial Social Science Research Council.

The functions of the new council will be: To suggest new subjects for research and how to set about them, to link in friendly liaison, existing scientific bureaux, to facilitate the transfer of scientific workers from one territory to another, and to suggest to the Governments concerned such specialist conferences as may advance the interests of Africa.

CHEMICAL IMPORTS RISE

October Total Over £1m. More Than 1949

IMPORTS of chemicals, drugs, dyes and colours in October were again marked by a substantial increase, the total value of £3,241,397 being over £1 million more than the corresponding month of last year and £388,670 higher than in September. Notable increases compared with a year ago were: Boric acid £10,667 (£5802); fertilisers £205,878 (£1104); sodium compounds (excluding sodium nitrate) £174,298 (£111,656); synthetic organic dyestuffs £137,078 (£54,927); and carbon blacks £338,953 (£188,078).

Decreases, as shown in the *Trade and Navigation Accounts of the United Kingdom,* from which the following data are abstracted, included potassium compounds £632,003 (£682,591), and gas and chemical machinery £20,494 (£320,936).

	October, 1950	October, 1949
	Cwt.	Cwt.
Acetic anhydride	2,072	4,117
Boric acid	3,900	2,801
Carbolic acid	5,447	—
Value of all other sorts of acid ...	£65,173	£47,295
	Cwt.	Cwt.
Borax	19,058	14,400
Calcium carbide	26,594	—
Cobalt oxides	536	271
	Tons	Tons
Fertilisers	22,710	35
	Lb.	Lb.
Glycol ethers and glycol ether-esters	559,274	308,241
Iodine	—	-
	Cwt.	Cwt.
Potassium chloride	772,687	767,165
Potassium sulphate	14,080	78,200
All other potassium compounds	13,754	2,868
Value of all potassium compounds	£632,003	£682,591
	Cwt.	Cwt.
Sodium nitrate	50,000	99,530
All other sodium compounds ...	26,589	4,741
Value of all sodium compounds	£174,298	£111,656
Value of chemical manufactures, etc., all other sorts ...	£970,169	£479,782
	Cwt.	Cwt.
Synthetic organic dyestuffs ...	1,596	479
Extracts for dyeing	4,836	425
Extracts for tanning (solid or liquid)	50,765	54,198
All other dyestuffs	182	369
Earth colours (except black) ...	24,699	7,858
Carbon blacks (from natural gas)	85,399	41,116
Value of carbon blacks ...	£338,953	£188,078
	Cwt.	Cwt.
Other blacks, including vegetable, lamp, acetylene and bone	14,306	2,215
Value of paints and extenders ...	£447,825	£250,368
Value of chemicals, drugs, dyes and colours	£3,241,397	£2,003,915
	Lb.	Lb.
Essential oils (other than turpentine)	591,088	483,623
Value of essential oils	£546,804	£289,495
	Lb.	Lb.
Synthetic oils	5,397	4,005
	Cwt.	Cwt.
Mineral jelly	17,637	6,209
Wax, petroleum: paraffin wax	35,559	57,061
Value of oils, fats and resins ...	£10,653,165	£8,835,327
	Tons	Tons
Aluminium oxide (crude, unground)	2,582	847
Silicon carbide (ground or graded)	842	484
Asbestos, raw and fibres ...	10,303	8,414
Diatomaceous earth	5,478	2,582
Graphite (plumbago) natural and artificial	589	430
Magnesite	2,695	1,349
Sulphur	36,227	36,270
Value of sulphur	£360,223	£316,248
Value of non-metalliferous mining and quarry products ...	£1,631,034	£1,179,887
	Cwt.	Cwt.
Gas and chemical machinery ...	665	28,836
Value	£20,494	£320,936
	Cwt.	Cwt.
Plastic materials	15,773	14,705
Value	£443,657	£451,162

Service to Steel Industry

THE Iron and Steel Institute's Sir Robert Hadfield Medal for 1951 has been awarded to MR. WILLIAM BARR, of Colvilles, Ltd., president of the West of Scotland and Steel Institute, for his contributions to research in steelmaking.

The Bessemer Medal for 1951 has been awarded to MR. BEN FAIRLESS, president of the United States Steel Corporation, for his services to the industry. Presentations will be made at the annual meeting in London in May, 1951.

DR. C. H. DESCH, F.R.S., past president, has been nominated an honorary member of the Iron and Steel Institute.

2500 More for Chemical Industries

AN increase of 2500 in the number employed in chemical industry was recorded in August compared with the previous month. The total (in thousands) was 449.1 compared with 446.6 in July. Detailed distribution (the *Ministry of Labour Gazette,* Vol. 58, No. 10), included: Coke ovens and by-product works 17.2 (16.7 men, 0.5 women); chemicals and dyes 205.1 (152.0 men, 53.0 women); explosives, etc., 36.5 (22.3 men, 14.2 women); paint and varnish 39.0 (27.7 men, 11.3 women); soaps, glycerin, etc., 49.7 (29.3 men, 20.4 women); mineral oil refining 36.2 (30.1 men, 6.1 women).

NUCLEAR REACTORS

Information to Help Training

RELEASE of some atomic information which would not be of material assistance to other nations in the development of military applications of atomic energy has been agreed upon by Britain, Canada and the United States.

The technical information now to be published includes details of existing piles and formulæ of nuclear constants of uranium. These will help in the instruction and training of technicians and scientists and thus contribute to the development of atomic energy for peaceful purposes.

Full particulars will be given of Gleep, the smaller uranium and graphite pile or reactor at Harwell; Zeep (Zero energy experimental pile) a heavy water and uranium reactor at Chalk River, Ontario.

Data on U.S. Reactors

The four U. S. reactors concerned are :—

The uranium and graphite reactor erected under the West Stand of the University of Chicago's Stagg Field in 1942 and subsequently dismantled; this was in fact, the world's first nuclear reactor; a modified version of this, now located at the Argonne Laboratory, near Chicago. A uranium and heavy water reactor at Argonne; and a homogeneous reactor using enriched uranium and ordinary water at Los Alamos, New Mexico.

In addition, certain information will be released about Bepo (British Experimental Pile), the larger of the Harwell piles, and similar reactors in U.S.A. and Canada.

The information was released on recommendations of the Fourth International Declassification Conference, held at the Atomic Energy Research Establishment, Harwell in February. Like the three preceding conferences, this was a continuation of the war-time collaboration of the three nations. It recommended revisions to the Declassification Guide which is used by the three nations to determine what atomic energy information may be published.

Minor adjustments, some more liberal and others more restrictive, have been made in other sections of the guide. As hitherto, information will be released by issuing individual documents after reviewing according to established practice. Values of pertinent nuclear constants of uranium will be published in a special technical report to be issued by the Atomic Energy Agencies of the three Governments.

CHEMICALS FOR EXPORT

U.K. and European Surpluses

AFTER a period of six months, the Organisation for European Economic Co-operation (OEEC) has published a second book on the subject of the exportable surpluses of chemical products in the 18 participating countries (THE CHEMICAL AGE, 62, 705). Actually, the information relates to all those countries which, up to the time of going to press with the book, had replied to the organisation's questionnaire. No reply was received from Portugal, and Iceland and Luxembourg have stated that they have no surpluses. The book is again printed throughout in French and English.

The U.K. and the Netherlands have not provided precise quantities of surpluses either at a given date or in the form of regular monthly estimates, but have again indicated whether the supplies for export were " limited," "adequate" or "ample" at the time the information was collected, which in the present instance was July.

Some of the figures and indications published may now be incorrect, on account of the rapidly changing international situation, and should therefore be considered as indicative only.

Britain's list of chemicals under the heading of " ample "—that is, of which all the export demand of which Britain is aware can be met as well as any reasonable additional demand—includes the following :—

Sodium fluoride ; arsenical acids ; tin oxide ; mercuric oxide ; tin tetrachloride ; mercury chloride ; bleaching solutions ; magnesium sulphate ; aluminium sulphate , copper sulphate ; chrome alum ; sodium nitrate ; mono-ammonium phosphate ; arsenates ; sodium carbonate , sodium bicarbonate ; bichromates ; mercury compounds ; chloroform ; carbon tetrachloride ; ethylene dichloride ; nitrobenzene ; methyl alchohol ; fatty alcohols (except lauryl alcohol) ; sulphonated fatty alcohols ; pentaerythritol ; xylenols and higher phenolic substances ; ethyl ether (sulphuric ether) ; formaldehyde ; metaldehyde ; methylal ; lactic acid ; tartaric acid ; dibutyl, dimethyl and dioctyl phthalate (limited quantities at present, ample later) ; trichloroethyl phosphate ; aniline oil, aniline and its derivatives ; *p*-phenylenediamine ; *m* and *p*-toluylenediamine ; urea ; organo-mercural compounds ; penicillin ; glandular extracts ; dental filling materials ; tannic acid and natural tannins ; various synthetic tanning products ; inks ; putties ; gelatin ; glues ; arsenical products (insecticides, etc.) ; sulphur products ; mineral and vegetable oil products ; insecticides with vegetable base (based on nicotine, derris, rotenone, pyrethrum) ; rodenticides ; disinfectants based on phenols and their derivatives, DDT ; sheep and cattle dips ; synthetic growth regulating substances ; synthetic detergents ; emulsifiers ; dye thickener , matting agents and optical bleaches ; foundry core binders ; chemical fluxes and die dressing for foundries ; synthetic waxes and chemically modified natural waxes , celluloid ; cellulose acetate ; metacrylics

COMMONS QUESTIONS

Fumes and Effluents Discussed

NO experiments on the underground gasification of coal have yet been made in Scotland according to a written answer made by Mr. P. Noel-Baker, Minister of Fuel and Power. Short-term experimental work was in progress near Chesterfield, but no decision could yet be taken to extend it to other sites.

IMPORTANCE of maintaining sufficient metal supplies to manufacturers was recognised by Mr. G. R. Strauss, Minister of Supply, in a written reply to questions. Every effort was being made to obtain adequate supplies of non-ferrous metals but this country was mainly dependent on imports and there had been a considerable increase in world demand. Steel supplies were good, but the Korean war and the rearmament programme had resulted in some delay to supplies.

IN reply to a question about the alleged storage of copper wire originally intended for China, the export of which was now forbidden, Mr. G. R. Strauss stated that no such storage had, in fact, occurred. The question of its diversion to home use did not therefore arise.

Fluorine Fumes

THE prohibition of discharge of fluorine fumes from factories in Scotland was raised by Lord Malcolm Douglas-Hamilton. Replying, Mr. Hector McNeil, Secretary of State for Scotland, said that at an early date he would be able to introduce a Bill to amend the Alkali, etc., Works Regulation Act, 1906, in its application to Scotland.

TO WHAT extent synthetic fibres were now being manufactured in this country as a substitute for wool was asked by Lt.-Col. M. Lipton. Several synthetic fibres could be used for blending wool replied Mr. H. Wilson, President of the Board of Trade, rayon staple fibre being the most general. Production of protein synthetic fibres was at present only on an experimental scale, but one plant should be in commercial production early next year.

QUESTIONED about radioactive effluent discharged into the river Thames from the Atomic Research Establishment, Mr. A. Bevan said that there was a wide margin of safety. The conditions regarding the amount of effluent discharged were determined on the advice of the Medical Research Council.

B

A CHEMICAL CENTENARY

Service to Analytical Chemistry

A MEDAL awarded to Hopkin and Williams, Ltd., for its exhibit of fine chemicals at the Great Exhibition of 1851 served to recall, in London last week, the company's distinguished record of service to analytical chemistry. The relic was shown by Mr. G. E. Howard, partner and director, who proposed the health of the guests at a centenary dinner, attended by many distinguished figures of pharmaceutical and industrial chemistry. He gave an entertaining commentary on the company's vigorous growth since 1850 as universal suppliers of fine chemicals and reagents.

Victorian Development

The significance of the anniversary was referred to by Dr. L. H. Lampitt (Imperial College), who proposed a toast in honour of the company. He recalled that Hopkin and Williams was almost a contemporary of the Chemical Society (founded in 1845) and now bore witness to the Victorian period of great development of chemical industry. Sir William Crookes had been one of the firm's advisers around the time it exhibited at the Great Exhibition. Its name on reagent bottles was for many their first impression on starting laboratory work. Many names had since come and gone, but Hopkin and Williams remained and to-day earned feelings of respect, thankfulness and reliance. Past work in the laboratories of Hopkin and Williams had been an essential factor in permitting the great advances in science and technology. Workers in industry and the universities depended upon such firms as this " to establish the advance camps."

Team Work

In his reply to the toast, the chairman of the company, Mr. J. E. C. Bailey, made cordial recognition of the long and devoted work of many of the staff and executives. There were many who, like Mr. Geoffrey Howard, had already spent 50 years with Hopkin and Williams. They were a magnificent team.

Sir Harry Jephcott, who spoke for the guests, recalled the firm's close links, in an era abounding in great men, with the early foundations of modern chemical industry. It had set up at the start a standard of purity from which it had never departed. He wished it another century of service as successful and epoch-making as the last.

Anti-Corrosive Pigments

Coated Granular Materials Described in German Literature

PIGMENTS consisting of inert particles coated with anti-corrosive colouring agents, the "Kernpigmenten" in Germany, are the subject of a recent report by B. F. H. Scheifele (*Farben, Lacke, Austrichstoffe* 1950, November, pp. 414-7).

B. H. F. Scheifele was the inventor of these pigments for which a patent application was made in 1936 (Sch. 110, 108) and he discusses recent developments in this field, including some of his own work.

The original patent claimed a method for production of pigments consisting of inert particle substrata coated with weather- and corrosion-resistant metallic compounds, such as lead salts, as colouring matter. This is said to be analogous to electroplating and is an effective and economical way of using fillers, for which numerous materials are available, including aluminium and barium compounds and silicon carbide.

Coating the Particles

Various methods may be employed for coating the particles, e.g., precipitation, condensation from the vapour phase, electro-coating, fractional mixed crystallisation, or mechanical means. Special mention is made of a suspension of barium sulphate in a lead salt solution, which is used for deposition of the lead as carbonate by reaction with ammonium carbonate. After drying the resulting powdered product, the insoluble lead salt coating is oxidised to red lead by heating. The addition of colloidal material to form a gelled medium is desirable.

Other recent developments noted include electrochemical methods and the earlier work of H. A. Gardner, as disclosed, for example, in English Patent Nos. 455,717 and 455,762.

In Germany, J. K. Wirth (*Korr. u. Metallsch.* 1940, *16* (10) 381) and H. Wagner (*ibid.* 1944, *20* (8) 224, and *Archiv. Metallunde* 1947, 439-444) studied the anticorrosive properties of the Kernpigments. Wagner used the electrochemical method of precipitation. He claimed that a lead pigment containing 8 per cent lead, superior to red lead as an anti-corrosive, could be obtained by this method. He suggested as ideal in this class of pigment the natural Veronese siennas of rhombohedric form. These consist of an inner dark-coloured nucleus of dolomite and iron carbonate and an outer layer of colourless, pure dolomite. He also found that the flake form of aluminium nuclear material was particularly favourable.

In his later work Wagner described four methods for the preparation of granular coated pigments: (a) Chemical: this is only applicable with flaked base material of easily oxidisable metals, e.g., degreased flaked aluminium powder with sodium chlorate or other oxidant. The method yields pigments of the Oxal type, with oxide layers remarkably reactive with fatty acids; (b) Colloido-chemical: in which, for example, lead salts may crystallise out on substrata of heavy spar, slate flour, or asbestin, but without complete envelopment of particles. It is preferable to use film-forming materials like the non crystallising organic lead compounds soluble in hydrocarbons, for instance, tridocyl-lead $(C_{12}H_{25})_3$. This is soluble cold in hydrocarbons and hot in fatty oil. (c) Structural-chemical or morphological: mostly involving mixed crystals.

In the case of $BaSO_4$ and $PbSO_4$ there appears to be some doubt as to the precise nature of the mixing. Wagner therefore tried these two salts dissolved in concentrated sulphuric acid in order to obtain mixed crystals by gradual addition of water; but the method proved impracticable. (d) Electrochemical: in which base metals such as Al, Zn, Mg, are contacted with lead salt solution. A thin lead surface film is formed, and pigments of the Plumbal and Sigal type are produced, also Plumboxal by further processing. Adhesive properties were still further improved by electrolytic treatment, yielding electrolytplumbal.

American Work

Other more recent methods briefly noted include the roasting process, e.g., with blanc fixe (precipitated barium sulphate) iron oxides, slate flour, etc.; and also the double reaction method in paste form with a wide variety of materials. Finally the author mentions some American work in this field but no British, the former being represented by F. J. Williams and A. R. Pitrot (*Ind. Eng. Chem.* 1948, *40*, 1948-1950, Anon, *Chem. Engg. News* 1948, *26*, 3488-3490). This relates to a method of producing granular coated pigments in which a silica nucleus is coated with basic lead sulphate and silicate.

PYRETHRUM-IN-OIL INSECTICIDES

Their Biological Standardisation

IT is now something like a century since pyrethrum was introduced as an insecticide in Europe and the U.S.A. For most of that period it was used almost exclusively as a powder, but the value of kerosene suspensions of the ground flowers gradually became known for space sprays; the formulation "1 lb. of pyrethrum flowers per gal. of kerosene" became widely accepted. Some aspects of the production and application of pyrethrum-in-oil sprays for household and warehouse use have been reviewed by Dr. E. A. Parkin, of the Pest Infestation Laboratory, Slough, Bucks.

Staudinger and Ruzicka's work on the molecular structure of the pyrethrins paved the way for methods for the chemical estimation of pyrethrins in flowers. The accepted formulation for oil sprays was soon shown to be unreliable because of the variable pyrethrin content of different parcels of flowers, but chemical standardisation of the extracts was possible and is now widely practised.

Dr. Parkin points out that the present methods of chemical assay, satisfactory as they may be for commerce, need to be still more precise in the light of recent knowledge of the pyrethrin-cinerin complex before they can be expectd always to accord with the results of biological assay.

Unfortunately, biological assay is no more reliable than chemical assay, for it is difficult to maintain stocks of insects with anything like a uniform level of resistance. Nevertheless, with the complementary use of chemical and biological asays, the processors of pyrethrum flowers can now produce adequately standardised concentrated extracts which may be diluted as required.

Standardised Sprays

The biggest sale of pyrethrum-in-oil sprays is almost certainly of those for domestic use to control flies, and a high proportion of the sprays sold is standardised biologically by comparison with the official test insecticide of the National Association of Insecticide and Disinfectant Manufacturers, New York. This preparation is the only generally available standard for the biological assay of pyrethrins and contains 100 mg. total pyrethrins per 100 ml. of extract, that is 0.1 per cent wt./vol. pyrethrins, the solvent being a refined kerosene.

The NAIDM has also recognised the Peet-Grady chamber technique as its official testing method, using the housefly as the test insect, and has instituted a system for grading sprays according to their performance in comparison with the official test insecticide. A spray approximately equalling the test standard in knock-down and kill is termed Grade B and most reputable manufacturers of fly sprays aim at marketing a Grade AA spray, which may be expected to have about 0.14 per cent pyrethrins in it.

Assuming that, in practice, the spray is properly applied with due regard to the habits of the insect, about 25 ml. of test insecticide per 1000 cu. ft. of space will give reasonable control of the housefly and about 10 ml. per 1000 cu. ft. should suffice for mosquitoes; but there is no safety margin with a Grade B spray at these levels of dosage.

Tests with Houseflies

Ordinary household sprays containing pyrethrum alone may be expected, therefore, to contain 0.1-0.15 per cent pyrethrins in a deodorised kerosene, but their standardisation is related solely to a satisfactory performance against houseflies, and in biological assay the test flies are reared and exposed to spray under artificial conditions. Tests with houseflies do not ensure that a spray will control efficiently other common domestic pests such as cockroaches, crickets, beetles, silverfish, ants, fleas, etc. Under normal conditions of application, some of these insects can be controlled by a pyrethrum fly-spray, while others cannot. It is surprising that there seems to be no clear statement of the relative resistance of these insects to pyrethrum sprays, although a systematised and extended statement should be very helpful to manufacturers of household insecticides.

It would clearly be uneconomic to manufacture insecticides with different concentrations of pyrethrins for each insect, but consideration might be given to the possibility of marketing for control of the more resistant species a stronger solution than those at present available, which are designed as fly and mosquito sprays. A good spray should have a margin of effectiveness to allow for some inefficiency of application.

Since the war, the use of pyrethrum in

household sprays has undergone a notable change. The pyrethrins are still regarded highly for their rapid paralytic effect on many insects, but they have often been found unreliable in their lethal effect because of the eventual recovery of many paralysed insects. Pyrethrum is now included, therefore, as a knock-down agent for quick preliminary action in sprays depending for eventual kill upon the incorporation of one of the newer synthetic insecticides, which, except at relatively high concentrations, are slow in action. The concentration required in a fly spray is a minimum of 0.03 per cent total pyrethrins, preferably 0.05 per cent unless an activator for knock-out is present.

Purified Extracts

The popularity of the aerosol generator in the United States has given rise to new formulations for fly sprays involving specially purified extracts of pyrethrins to prevent the deposit of resins which might block the dispenser during storage or use. The dispensers usually contain sufficient 20 per cent pyrethrum concentrate to give about 1 per cent pyrethrins in the contents or about 0.4 per cent pyrethrins, if 3 per cent DDT is included. The concentration of insecticide in the mist remaining after evaporation of the propellent from the spray is normally from six to 16 times greater than the foregoing figures.

In the control of insects infesting stored products, especially foodstuffs, pyrethrum-in-oil sprays have been much used in Britain. These warehouse sprays contain about 10 times the concentration of pyrethrins and the carrier is a refined white oil with a viscosity only slightly less than that of medicinal paraffin. The use of a relatively heavy oil is nece sary to comply with the fire prevention regulations.

Early in the war, stocks of foodstuffs, especially grain, had to be stored in Britain for unusually long periods, frequently in buildings not designed for the purpose and not capable of treatment by fumigation. When infestation occurred in such conditions the only insecticide suitable for spraying was pyrethrum. Such treatment could not normally be expected to eliminate the infestation because of the difficulty of reaching all the insects with the spray. Nevertheless, it helped materially to limit the severity and spread of infestation.

The spray employed contained 1.6 per cent wt./vol. total pyrethrins, the limit to the concentration being set by the cost of the pyrethrins, their acute shortage, and the risk of discoloration of goods. For this particular application the concentration of pyrethrins in warehouse sprays has been reduced slightly to the present figure of 1.3 per cent.

Dr. Parkin states that there is room for improvement in the toxicity and persistence of pyrethrum sprays for use against stored product insects. But the number of substances which might be added to pyrethrins for this purpose is severely limited by the necessity for avoiding those which are hazardous to man during application, or toxic on ingestion, or liable to give rise to off-flavours or discoloration of the products sprayed. Nevertheless, research is proceeding continuously, and already with some success, to discover substances having a good synergistic action with pyrethrins, so that mixtures may be compounded which are virtually non-toxic to man, possessing the outstanding knock-down effect of the pyrethrins, and having the lethal effect of the pyrethrins so strengthened that few affected insects are likely to recover from the stage of paralysis.

In the U.S.A. oil sprays are apparently little used against stored products insects, the outstanding recommendation for their application being in the control of insects affecting tobacco in store. In general, the number of concentrations of pyrethrins commonly used in oil sprays is very small, and in almost all instances the concentration has been determined experimentally as suitable for control of a particular species of insect under prescribed conditions. The maximum concentration, however, is determined by other considerations. The field of use of each concentration has been broadened without an adequate backing of experimental work and many claims have been put forward which, it is felt, would be difficult to justify.

Lethal Strength

In household sprays the best use of the pyrethrins is undoubtedly formulating them with another more lethal insecticide while ensuring that the concentration of pyrethrins is quite adequate to cause quick knockdown. In warehouse oil-sprays, more lethal agents than the pyrethrins cannot at present be used, except under very restricted circumstances. Until new insecticides are discovered which have a greater differential in toxicity between mammals and insects, some improvement can perhaps be expected from the use of pyrethrins with relatively non-toxic activators to increase the lethal effect of the insecticide.

CITRACONIC ANHYDRIDE

Its Properties and Some Likely Industrial Uses

From A CORRESPONDENT

CITRACONIC anhydride is formed by molecular rearrangement of itaconic acid. This can be made from the tribasic aconitic acid by the loss of carbon dioxide or directly from citric acid. Citraconic anhydride is also easily prepared by the distillation of citraconic acid (Crasso Ann. 34, 65, 68 (1840)) and it can also be made from the isomers of itaconic acid, by heating itaconic anhydride, or by heating itaconic acid or mesaconic acid.

The best known method of preparing citraconic anhydride is by distilling citric acid and aqueous citric acid under vacuum (Anschutz, Ber. 13, (1880): Ber 37,3970 (1904)). A German patent (678,985) taken out in 1939 describes a method of producing the anhydride from citric acid by distilling concentrated aqueous solutions of the acid under vacuum at 230° C. The distillation yields a mixture of citraconic and itaconic acids or anhydrides which can be separated and purified.

Although Baup first isolated citraconic anhydride as long ago as 1837 together with itaconic acid by distilling citric acid (Baup, Ann. 19, 29-38 (1837)) it is only within the last fifteen years that the anhydride has received any serious industrial consideration.

Properties

Citraconic anhydride is a liquid boiling at 213.5° C. at 760 mm. It freezes when cooled in ice and melts at 6° C. The anhydride hydrolyses in water more slowly than itaconic anhydride and is more soluble in organic solvents than either itaconic or maleic.

Citraconic anhydride reacts vigorously with primary amines and forms half esters with alcohols. With halogens it forms a series of halogenated chemicals by addition to the double bond, e.g., with chlorine in carbon tetrachloride the anhydride gives methyl dichlorosuccinic acid. Of particular interest is the discovery of Diels and Alder (Ann. 460,98 (1928)) who found that the conjugated system of citraconic anhydride adds to other conjugated systems. This enables the anhydride to be used to separate conjugated from non- or less highly conjugated compounds.

Ammonia reacts with citraconic anhydride vigorously to form ammonium citraconamidate and when the anhydride is heated in an autoclave with alcoholic ammonia at 108-110° C., methyl asparagin is produced.

Much interest has been shown in the polymerisation of esters of citraconic acid; the condensation of the anhydride with resin or terpinene to form useful resins; the reaction of citraconic anhydride with an olefin of the isobutenyl type to form resins, etc.

Industrial Applications

The most promising industrial uses likely to be found for the anhydride can be summarised as follows:—

1. Separation of azeotropic mixtures where one component is an alcohol. Although maleic anhydride can be used for a similar purpose, it is more difficult to regenerate and being a solid it is not so convenient to handle as citraconic anhydride.

2. Separation of conjugated from non- or less highly conjugated compounds, e.g., isolation of Vitamin D_2 from tachysterol formed during the irridation of ergosterol.

3. Formation of synthetic resins by polymerisation and condensation reactions. In 1934, du Pont patented a process for the polymerisation of esters of citraconic acid and combining the polymers with conjointly polymerised vinyl esters or styrene to give resins suitable for coatings (1,945,307) Another U.S. Patent discloses a method of making resins suitable for impregnating fabrics and for general moulding by reacting citraconic anhydride with compounds such as dimethylallyl ether compounds. A further U.S. Patent, 2,383,933, 1945, covers a method of making water—dispersible resins for sizing paper—pulp by heating resin or terpinene with citraconic anhydride to 150-160° C. together with water and an alkali carbonate.

4. Pour point depressants for lubricating or fuel oils can be made from citraconic acid according to American Patent, 2,412,708, 1946, by reacting it with various amines such as octadecenylamine and octadecylamine.

Cement and Concrete Research

Some Alternative Methods of Protection Against Erosion

THE Cement and Concrete Association is, broadly speaking, the information and concrete research organisation of the Portland cement industry in Britain. Originated in 1916 as the Concrete Utilities Bureau, the association was constituted in its present form to encourage the best possible utilisation of concrete and to find new and more efficient applications for the material. Shortly after the war it opened a research and development station at Wexham Springs, Stoke Poges, near Slough. This is divided into four sections, namely, chemical and physical, concrete, structures and development. Most of the time of the chemical and physical section is at present spent on service work for other sections of the station and in dealing with outside requests.

Chemical Attack

Samples of concrete which have deteriorated are frequently sent to the association for investigation. In some instances deterioration is found to be traceable to chemical attack by reagents such as acids or sulphates, the presence of which can usually be detected by chemical analysis. The association has accumulated a large amount of valuable information regarding the effects of reagents and effluents on concrete and is often able to offer advice when constructional problems of this type are encountered.

It is hoped that, in course of time, the research programme will provide more information on the structure of hardened cement, of which there is at present little precise knowledge. This subject is extremely complex because, by its very conditions of manufacture, cement is anything but a pure material.

Among the problems which have been investigated by the chemical and physical section is the erosion of concrete by soft acid waters. This problem is frequently encountered in the design of reservoirs in the North of England, where the water is run direct from hill streams into the reservoir before passing on to the waterworks. The investigation covered the use of all cements commercially available and trial concrete mixes were made with varying cement/aggregate and water/cement ratios.

The results of these experiments seem to warrant two conclusions. In the first place, alternative methods of protection are indicated; either the surface of the concrete must be completely covered by an impermeable film or the concrete itself must be made as impermeable as possible consistent with the strength required. The second conclusion is that the initial rate of attack on the concrete, if measured as a loss of strength, is approximately inversely proportional to the strength of the material.

Under the aegis of the association a training centre was started this summer at Wexham Place, a few hundred yards from the research station at Wexham Springs. Five-day courses are given to engineers and others on certain main uses and applications of concrete and the control and production of high quality material. Many of the courses are concerned more especially with pre-stressed concrete.

4800 H.P. for Cement Production

THE British Thomson-Houston Co., Ltd., recently received orders from Associated Cement Manufacturers, Ltd., for the supply of four 1200-h.p., 750-r.p.m. synchronous-induction motors and speed reducing gearboxes, to drive two cement grinding mills at 20.5 r.p.m. from a 3000-volt, three-phase, 50-cycle supply.

The motors are specially designed for operation at 0.95 leading power factor, thus compensating for the lagging power factor of other smaller induction motors used at the works. An efficiency figure of 97 per cent has been guaranteed. Starting a mill of this type demands 50 per cent above normal full load torque from the motor. The salient features of a synchronous-induction motor—high efficiency, leading power factor and high starting torque —are therefore all fully exploited in this application.

It is proposed to run the mills 8000 hours per annum, and 30 years' reliable service is demanded. This equipment should contribute to increased production of cement, now urgently required for the housing and general building programme at home and for export.

METAL GRIT FOR SAND-BLASTING

Advantages of Si:Mn Steel Over Quartz

IN recent years the application of silicon-manganese steel grit for modern sand-blasting has undergone considerable development. This is because the results obtained are appreciably better than when quartz sand is used; it is only necessary to magnify the grit particles about six times to confirm the excessive sharpness of the Si :Mn steel particles compared with those of quartz sand.

Natural materials such as quartz or river sand involve high transportation, drying and storage costs, since large quantities require to be stored. Thus, although sand is initially cheaper the balance greatly favours the steel grit.

The working period of the grit is claimed to be about 60 times that of quartz sand, due to its great hardness and resistance to wear. Its use obviates the need for large storage rooms and, because it is free from dust, dust removal systems are not required. Steel shot of the same material has globular grains which vary in size between 1 mm. and 6 mm., and is supplied in up to 8 grades, while the sharp-edged grit ranges from 10 to 12 grades.

The efficiency, as expressed by the ratio of the surface pressure on the work to the nozzle back pressure is approximately 10 per cent higher than with selected sands. That applies to both sharp-edged and globular varieties and is due to the greater specific weight of the granular metal over the natural sands, and the better utilisation of the energy of compressed air which that permits. Whereas quartz sand requires between 7 and 40 p.s.i. pressure, the most effective pressure range for the steel grit is between 14 and 40 p.s.i. with the finer grades, and between 40 and 85 p.s.i. for the coarser grades.

Surface Cleaning

A surface cleaned with the silicon-manganese grit or shot is slightly darker than with sand cleaning. This is due to a fine dust coat, which is easily removed by a stream of compressed air. A more firmly adherent coat is left by quartz. Apart from this, the appearance of the cleaned part is more uniform, while difficult sections are more easily handled.

The dross which results from the work is removed solely by the exhausters normally used with sand-blast plant, but without the need for special appliances. Even after long and continuous service, rust will not appear on the shot, provided that the regular oil and water separators in the compressed-aid line receive proper attention. Likewise the grit will retain the desired sharp edges and clean appearance. Recently the Si :Mn content has been increased so as to improve rust resistance. This does not affect the hardness. The cutting or grinding action of steel grit on the chilled-iron nozzles is only about one-sixth of that produced by natural sand.

Cleaning Hardened Tools

An example of the advantages of using grit is furnished by a firm engaged on cleaning hardened tools. Over a four-month period 650 lb. of steel grit was sufficient to do work for which about 6000 lb. of quartz sand was formerly required. Furthermore, when grit was used the sludge sump only required cleaning out twice during the four months, as compared with a weekly two-hour cleaning when sand was used. Daily replenishment of the grit took only a minute; on the other hand, replacing the sand occupied half an hour. The appearance of the finished parts was improved and the money saved by using grit was estimated at 13 per cent.

Still greater benefits were acquired in a foundry engaged on iron castings. An increase in output of 33 per cent was achieved because two revolutions of the rotary table sufficed with steel grit cleaning, whereas three rotations were necessary with quartz sand. In the tumbling barrel lay-out of a steel foundry, operated with four stationary nozzles fed by two compressors, the gain in output using steel grit amounted to 25 per cent. This was because, in an eight-hour day, the best grade of quartz sand could only clean 1800 lb. of 1 to 2 lb. castings, whereas the grit cleaned 4400 lb. and with a better finish.

Research has revealed that a nozzle bore of from 0.3 to 0.4 in. is about the best for steel grit, with working pressure of between 20 to 35 p.s.i. for fine grades, and from 40 to 55 p.s.i. for coarser grades.

Briefly, average consumption of grit amounts to 220 lb. compared with from five to six tons of quartz sand in providing the same service. The average space occupied is about 0.9 ft.^{3} Small bins located at one side of the blasting machines obviate all separate storage.

COMMERCIAL SUPPLIES OF ZIRCONIUM

Over 50,000 lb. Annual Production in U.S.A.

LARGE-scale production of zirconium metal has been initiated in a new mill at the U.S Bureau of Mines' Northwest Electro Development Laboratory at Albany, Oregon. At the recent National Metals Congress in Chicago it was disclosed that the whole of the current production, some 50,000 to 60,000 lb. annually is expected to be allocated to the United States Atomic Energy Commission. The metal's corrosion-resisting qualities indicate, however, that it will have widespread industrial uses, notably in the manufacture of instruments, and corrosion-resisting applications in chemical industry. Zirconium metal is now being produced in sponge, ingot, and sheet forms.

Production Problems

Many serious production problems had to be solved. Like titanium, melted zirconium is practically a universal solvent and either reduces or dissolves the refractory crucibles. For ductility it must be made by a process which excludes oxygen or nitrogen.

Ductile zirconium made by decomposition of zirconium iodide was first produced about 26 years ago by Van Arkel and his co-workers at the Phillips' plant in Eindhoven, Holland, and has been developed commercially in the United States by the Foote Mineral Company, Philadelphia, Pennsylvania. Zirconium metal has also been produced commercially in the United States by the Titanium Alloys Manufacturing Company, Niagara Falls, New York, and the Metal Hydrides Company, of Beverley, Massachusetts. At the Bureau of Mines the metal is obtained by reducing zirconium chloride with molten magnesium.

Zirconium Alloys

In addition to the commercially pure grades of the metal, scientists both in the United States and abroad are continuing to study the possibilities of using alloys of zirconium. Iron alloys of up to 5.5 per cent may be used in products when corrosion resistance is the objective and other metals are not suitable.

The chief problem in the treatment of zirconium ores has in the past been the decomposition of the silicate, and most processes described in the literature refer to the treatment of silicate. The methods of decomposition of the ores may be divided into the following groups:—

1. Volatilisation of silica by milling with carbon in an arc furnace. In 1937 and 1939, C. I Kinzie and D. S. Hake (United States Patents No. 2,072,889 and No. 2,168,603) patented methods for the thermal dissociation of zircon combined with the simultaneous preparation of either silicon carbide or zirconium carbonitride, using carbon resistor furnaces of the type employed for making silicon carbide. The treated product has to be roasted in air to obtain ZrO_2. Kinzie claims that in this way an oxide better than 98 per cent pure can be made from siliceous ore.

The acid treatment method, with HCl or H_2SO_4, requires the ore to be sintered with CaO at 1200°C., dissolved in HCl and precipitated to give $ZrOCl_2$ and H_2O from concentrated $CaCl_2$ solution. There are alternative methods.

Fluxing with alkalis is commonly used for making zirconium oxide for the enamel, glass, and porcelain industries which require a product containing some alkali; zirconate is produced in addition to silicate. F. Ullmann described the alkali-fluxing process in Germany in 1932.

Extraction Methods

Further alternatives are fluxing with sodium sulphate and sodium bisulphate and chlorination. Chlorination of the ore is said to provide marked advantages for the elimination of impurities, since iron and alumina can be excluded by precipitation of the zirconium as oxychloride, while the retention of silicon and titanium can be avoided by using a heated condenser. It has been proposed by L. Teichman and H. Martini (British Patent No. 520,740) to chlorinate the ore and to use the hydrochloric acid formed in the hydrolysis of the zirconium chloride to leach the undecomposed residues after a thermal treatment.

The most interesting zirconium alloys are those with copper, which are age-hardenable and good conductors of electricity; those with magnesium, which have good mechanical properties, high elongation, and excellent corrosion resistance; and those with iron and silicon, used as scavengers for steel and for grain control. In the United States alloys are chiefly with copper.

Metallurgical Section

Published the first Saturday in the month

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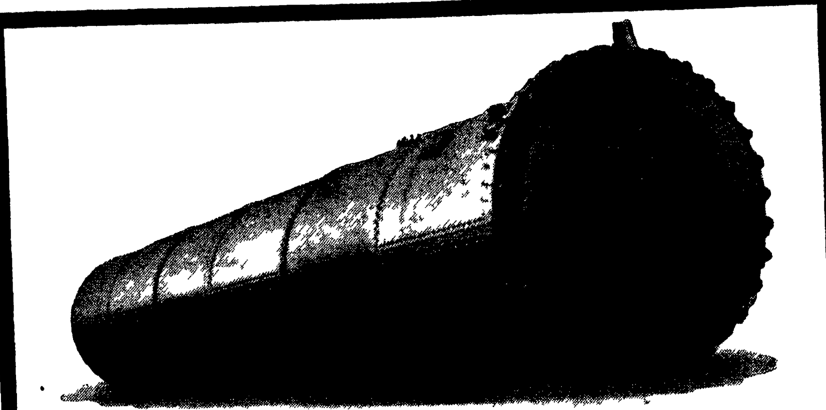

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Metallurgical Section

2 December 1950

ANTIMONY MINING IN SOUTH AFRICA

Planning for Largely Increased Yields

THERE has been a notable expansion since the war of antimony production in South Africa from 24 metric tons in 1938 to 4528 tons of concentrates in 1945. Production last year amounted to 7990 short tons of antimony concentrates and cobbed ore with an antimony content of 59.65 per cent. The Union is now the largest producer of this metal in the Commonwealth and the entire output is under contract to Britain.

Production is confined to the Murchison Range in the North-Eastern Transvaal, where a long and narrow belt of mineralised schistose rocks occurs in granite and gneiss. The feature of this belt is a mineralised zone, " the Antimony Line," which is characterised by antimony minerals. The most important of these is stibnite, but berthierite, tetrahedrite, corynite, chalcostibite and various oxides of antimony occur in minor quantities.

Although mineralisation occurs throughout the greater part of this line, only at certain localities have antimonial deposits of commercial value been found. These are mineralised lens-like irregular bodies, varying in width from a few inches to 20 ft.

Gold and Silver Content

All the antimony minerals contain some gold and silver and it was for their gold content that the reefs were originally worked. There have, in fact, been three distinct phases in the mining of Murchison ores. Originally the antimonial ores were worked exclusively for gold, reduction being complicated bv the refractory nature of the ores. Then antimony was exploited as a by-product and now it might be said that antimony has become the main product and gold the by-product.

Antimony was mined in the Murchison Range as far back as 1913, when 48 tons of antimony sulphide were produced from ore assaying 12½ per cent stibnite and 7 to 8 dwt. of gold per ton. High prices for the metal, which for a short period actually exceeded £70 per ton, led to a considerable expansion of output during the first world war, production reaching its peak in 1916 with an output of 770 tons. Thereafter it rapidly declined and for more than 20 years was confined to small and sporadic outputs.

The Consolidated Murchison (Transvaal) Goldfields and Development Co., now the Union's main producer and exporter of antimony ores, was registered in April, 1934, and holds an area of 2745 claims acquired from smaller concerns previously operating in the Murchison Range, and some freehold land. During 1937, 10 stamps from one of the properties acquired were re-erected by Consolidated Murchison at its main plant for use in the production of antimony concentrates.

Expansion Programme

Throughout the last war, antimony was in such keen demand that Consolidated Murchison were able to embark upon a long-term programme of expansion. Additions to the antimony plant were made and the company now has two plants in operation, one of which is treating plain gold ores and the other antimonial ores from which a certain amount of gold is extracted. Metallurgical investigation and selection in mining have resulted in the production of an improved concentrate containing a higher percentage of antimony and less impurities. In view of the improved antimony extraction technique, there seems to be no reason why the antimony concentrates produced should not be capable of competing favourably against pre-war sources of supply.

The emphasis on antimony rather than gold production has been particularly evident since the war. In March, 1948, for example, milling amounted to 10,100 tons and the revenue from both gold and antimony totalled £41,776. Of this £34,000 was derived from the sale of antimony. As a result, taxation reliefs applicable to base mineral mining have stimulated Consolidated activity. It is understood that the development programme, to seek new orebodies, which was announced in 1947,

has had satisfactory results and that the new antimony orebodies are sufficient to ensure a long life at a high rate of production. Exposures of antimony ore in two of the principal sections are reported to be satisfactory. On December 31 the ore reserves, estimated to be payable because of their combined antimony and gold content, amounted to 90,000 tons.

Following the encouraging results of development, steps were taken to increase the capacity of the mill and reduction plant to handle 20,000 tons a month. In the last three months of 1949 there was a restriction of tonnage milled to only 12,800 tons a month, because of shortage of African labour. That difficulty is being overcome. During the quarter ended March 31 of this year, 43,200 tons were milled.

OIL BONDED CORES

Methods of Reducing Fumes

PRACTICAL methods of reducing the emission of fumes from oil bonded cores have been summarised in a technical report recently issued by the Joint Standing Committee on Conditions in Iron Foundries (HMSO, 4d.).

Attention was drawn by the committee to irritating and disagreeable fumes that may be given off when certain types of binders are used in the foundry. The technical report refers to certain methods already suggested for reducing the amount of fume evolved, including the development of core binders which do not give disagreeable gaseous products on decomposition.

The committee recommend these methods for the full consideration of the industry, recognising that development of new binders must be a long-term policy.

The 28 recommendations of the committee are summarised at the end of the technical report, and include the following points:—

General: The number of mixtures used should be reduced to a minimum and the importance of mixing operations should not be underestimated. Extravagant use of binders should be avoided.

Storage of binders: Extremes of temperature and, in the case of powders, dampness, should be avoided.

Sand: Consideration should be given to the grade used and the proportion of clay and other fines kept to a minimum.

Storage of Mixed Sand: Conditions should ensure the lowest possible evaporation of moisture.

Baking: Stoves should be provided with means for recording and controlling temperature.

Casting: All vents should be lighted after casting.

Types of cores: "Shell" cores should replace large solid cores wherever possible.

Core block moulding: The minimum quantity of binder should be used and moulds should be cast under a hood fitted with efficient local exhaust ventilation.

U.S. MAGNESIUM OUTPUT

Further Expansions Predicted

EXPANSION of U.S. production of magnesium by 400 per cent, from 48 million to 240 million lb. a year, required by the continually increasing demand, was predicted recently by Dr. J. D. Hanawalt, general manager, magnesium division of the Dow Chemical Co., at the annual meeting in New York of the Magnesium Association.

The Dow Company is at present sole producer of magnesium in the U.S.A., its plant at Freeport, Texas, having a capacity of 4 million lb. a month. Additional output of 112 million lb. is expected from the re-opening of six other primary plants, which were in use during the war.

Describing the outlook for expanded use of magnesium, Edward S. Christiansen, president of the Magnesium Company of America and president of the Magnesium Association, said that large continuous rolling mill facilities for making magnesium alloy sheet will be available early in 1952 at Madison, Illinois, in a Dow Chemical Company plant. He predicted lower costs when this plant comes into operation.

Greater use of magnesium for non-military products would be dependent to some extent on Government plans for building up reserve stocks. Mr. Christiansen quoted figures to show that consumption of magnesium was increasing more rapidly than any other metal. In process applications wider use of magnesium was made in ductile cast iron and in the manufacture of titanium and zirconium.

Magnesium's use for military purposes was also illustrated by two speakers. Mr. E. Howard Perkins, whose firm is now engaged almost exclusively on the defence programme, said increasing quantities were being used for bombers. Mr. J. P. Donald Garges pointed out that progress made in overcoming problems of ductility, corrosion resistance and fabrication of magnesium had increased its adaptability to exacting aircraft requirements, offering advantages not conferred by aluminium.

STEEL TUBE PRODUCTION

Automatic Machinery Used by U.S. Firm

From OUR NEW YORK CORRESPONDENT

AMONG the machinery recently installed at the National Tube Company's new works at McKeesport, Pennsylvania, is equipment for the mechanical handling of raw and finished material, special processing plant, and modern industrial presses and other power items.

The plant is scheduled to produce 100,000 tons of electrically-welded steel pipe every year, in sizes ranging from 26 to 36 in. Stock consists of plates from ¼ in. to ½ in. thickness, with a carbon content of 0.20 to 0.30 per cent and containing 0.85 to 1.25 per cent manganese.

The major units of the mill are sixteen machines used for converting plates to tubes. Ample use is made of roller conveyors for moving the heavy material from unit to unit. First end-sheared, the plate stock is then side-planed and bevelled, and, after edge-rolling, the plate is formed into a "U" by a heavy press. The stock is then formed into a tube, by another press and is then welded outside and inside.

Following this operation the stock is then expanded in a special hydraulic machine that increases the tube diameter by stretching the steel under water pressures of up to 3000 lb. p.s.i. The tubes are then bevelled and end-faced.

Making Plates into Tubes

Fabricating plates into tubes begins in the west end of the new mill where material is started through the plant from a transfer car of 10 tons capacity. When loaded the transfer car is rolled into line with a conveyor table. Electric magnets mounted on a remote-controlled trolley feed the plates on to the conveyor leading to two conventional down-cut mechanical shears mounted together in line. The sheared plate moves on to a run-out table and is then conveyed by drag chain to the planer feed table. Each of these machines, set back to back, consists of a clamp-down bed and a moving platform, on each of which 11 cutters are mounted. These cutters are off-set for increasingly deeper cuts and bevelling.

The plate is then transferred to a plate edge-forming machine. This consists of three adjustable rolls, which give a slight curve to the plate edges. From here the plate is fed into the " U " press by table rolls and a mechanical pusher. Under pressures of up to 2000 tons the plate is then pressed into a deep "U" form.

The formed " U " plate then proceeds to the "O" press and is mechanically fed into the machine. The "O" press is capable of pressures up to 18,000 tons (three integrated presses of 6000 tons each) and forms the plate into a tube.

Utilising a series of conveyors and skids the tube is then dispatched to one of the outside welding machines. These are submerged twin-arc AC fusion welders

Plate being formed into a tube in the hydraulic machine capable of pressures up to 18,000 tons. Inset (top left): An inspector travelling on a dolly through a 30 in. diameter steel pipe examining a welded seam

equipped with gas preheaters. Flux is fed from an overhead bin and after the weld, the unburned flux is picked up by vacuum and returned to the overhead bin for re-use. A rotating disc shears off the burned flux which is then also removed by suction into a disposal hopper. The tube next moves by conveyor table to the manual squirt welders where, to assure a perfect weld and penetration on both ends of each tube, approximately six inches of the seam are welded. The tubes are then rolled to two idler conveyors from which they are fed to either of two inside welders. Here the tube is placed weld down on a movable carriage. The inside welders, mounted on fixed arms, consist of twin arcs with DC on the lead and AC on the trailing arc. They are preceded by gas pre-heaters.

The pipe is conveyed automatically to a flux remover, where the burned flux is knocked of by an automatic hammer operating on the outside of the tube and removed by suction. From here the pipe is automatically returned by conveyors to one of three tables for its first inspection.

An interesting new piece of equipment at the mill is the hydraulic expander. The tube is lifted into this machine and a tapered ram is inserted in the end of the can. The ends are mechanically belled by pressure insertion of the tapered ram and plug. A rubber gasket seal on the ram insures a water-tight connection. A four-section die, machined to the specified finished OD is placed around the pipe which is then filled with water.

The thickness of the tube walls determines the pressure applied to expand the pipe up to the specified OD. As the pipe enlarges in diameter it is reduced in length and as it reduces in length, the plunger automatically advances to maintain a water-tight seal. Water pressure is then dropped below the yield point of the steel. Two end dies are opened and air hammers are struck against the pipe for testing. If no leaks appear, the other two dies are opened, pressure is again dropped and the entire seam is inspected visually for leaks.

Three centrifugal pumps supply water to the expander from a 25,000-gallon reservoir. Pressure is applied by means of two accumulator systems.

Combating River Pollution

THE second reading of the Rivers (Prevention of Pollution) Bill was moved by Mr. A. Bevan, Minister of Health, in the House of Commons this week. One step forward had already been made, he said, by the establishment of river boards some of which were already established.

Among the points raised by various speakers Mr. A. Colgate said that the effects of sewage pollution were not nearly so serious as those caused by metal solutions.

Mr. G. R. H. Nugent said that it was possible to clear any effluents provided that there were sufficient resources available. The Harwell Atomic Research station had purified atomic effluent, but the plant had cost about £1 million. The new plant at Kingston in full operation would require about 100 million gallons of cooling water a day, and even with a river as large as the Thames, this imposed a very heavy strain on the river flow during the summer. These stations being erected would present serious problems.

The condition of the river Medway at Aylesford was now made abominable by the effluent from the paper mills, said Mr. J. C. Rodgers. Its state has been described in a parody of some famous lines:

I do not chatter any more,
How could my waters chatter?
Crawling along twixt shore and shore
Chock full of morbid matter?
The food the fish are wont to eat
Has now a thorough coating
Of China clay and sugar beet
With surface creosoting.

Dr. R. F. B. Bennett suggested that the Bill should be applied to Southampton Water and its surroundings which was suffering from greasy industrial waste.

A new and formidable element of pollution had arisen, said Mr. G. C. Hutchinson, in the great public monopolies created by the Government. The National Coal Board was to have protection which would not have been afforded to the old collieries and the British Electricity Authority with its new power stations was abstracting water from rivers, and discharging it back again at high temperature.

Mr. A. Blenkinsop, Parliamentary Secretary, Ministry of Health, said that it was the Government's desire gradually to establish practical standards of purity in river effluents, so that eventually the general standard could be raised. Their expectation was that a series of standards would be laid down for the different reaches of rivers, in each instance ensuring a gradual raising rather than lowering of standards.

The Bill was read a second time.

HEATING OF NICKEL ALLOYS

Susceptibility to Attack by Sulphur

SUCCESSFUL hot working of nickel and the high-nickel alloys depends largely upon correct heating. This involves consideration not only of temperature and time required for heating but also of control of the furnace atmosphere.

The most important difference between the heating of nickel and the high-nickel alloys and the heating of materials such as mild steel, chromium-steel or some non-ferrous alloys is the greater susceptibility of the nickel-containing materials to attack by sulphur during heating. Metal surfaces which have been attacked by sulphur at high temperatures have a distinctly burned appearance and if the attack is severe, the material is weakened mechanically and may be rendered useless.

Exposure of the hot metal to sulphurous atmospheres or to other sulphur sources must be avoided. Fuel is the most common source of sulphur, and care has also to be taken in selecting the type of fuel used.

Gas is the most desirable fuel, requiring only a small combustion space and permiting automatic regulation of temperature and of atmosphere within the heating compartment. Town gas, which is low in sulphur is quite satisfactory, the maximum permissible content depending on whether furnace conditions are reducing or oxidisings.

Cost of Butane and Propane

Butane and propane are also desirable fuels. While their cost on a B.Th.U. basis is higher than that of oil, the ultimate cost per pound of finished forgings may easily be lower. Both gases are obtainable in cylinders with pressure regulators, a form particularly useful for occasional work in heating Monel, nickel and Inconel for forging, hot-working and riveting.

Solid fuels are unsatisfactory because of the difficulty of obtaining proper heating conditions, inflexibility in heat control and the presence of excessive amounts of sulphur. While it is not impossible to heat the high-nickel materials with the solid fuels such as " blacksmith " coal or coke from coal treated to reduce sulphur, it is very difficult to obtain satisfactory results, and the practice is not recommended.

Other potential sources of sulphur are scale, slag, and cinder on the hearth of the furnace.

To prevent contact with these, the work should be supported above the hearth on rails or supports. The possibility of the furnace brickwork containing sulphur from previous operation on high-sulphur fuels should also not be overlooked.

Sulphur may also be introduced in the form of sulphate salts and sludge remaining on the work from a prior pickling operation or in oil and lubricants used for machining or other fabricating operations. All such contamination should be completely removed before heating. It is also advisable to remove all marking paint, which frequently contains metallic sulphide pigments that can cause embrittlement of the painted areas.

Working Temperatures

Monel, " K " Monel, nickel and Inconel show important differences in their requirements of hot-working temperatures, particularly in the upper safe heating limits and tendencies towards reduced hot ductility.

While the high-nickel materials are being heated, the furnace temperature should be held about 30° C. higher than that at which the work is to be " pulled " and in no case should it be pulled at temperatures below 1100° C. The practice of working the furnaces at excessive temperatures in order to reduce heating time is damaging to nickel and high-nickel alloys.

Though many shops heat nickel and nickel alloys successfully without the aid of pyrometers or automatic temperature control, it is wise to provide these facilities. In their absence, however, preliminary trials should be made on scrap pieces to assist the judging by colour of proper temperatures for hot-working.

* Particulars of hot-working methods (from which the above are abstracted) are given in a handbook on the hot-working, annealing and pickling of Monel nickel and Inconel, published by Henry Wiggin & Co., Ltd., Birmingham.

Burma's Expanding Aluminium Industry

Production of Burmese aluminium fabricating factories is now about 2000 tons annually, compared with 538 tons before the war. Mr. U. Ba Thwin, vice-president of the Burma Aluminium Workers' Union, proposes that industry should receive further Government grants and is pressing for control of imports and removal of general sales tax.

Continuous Casting of Steel

Even Larger Mouldings to be Developed

CONTINUOUS casting of steel has progressed to the point where it is now possible to cast oval sections of 25 to 40 sq. in., Mr. Isaac Harter, chairman of the board of the Babcock and Wilcox Tube company, has reported to the American Academy of Arts and Sciences, Boston, Massachusetts. He also reported that within a year a new mould would be tested which will make it possible to produce a casting with a cross section of 100 sq. in., suitable for rolling into 25-in. strip in a continuous sheet rolling mill.

Mr. Harter considered that the new steelmaking process could ultimately be applied to about 15 per cent of America's output and that improvements now being perfected would increase its application to between 25 and 30 per cent of steel production.

The feasibility of continuous casting of steel was proved two years ago by the Babcock and Wilcox Tube Company and the Republic Steel Corporation; successful large-scale experimental continuous casting has been an objective of the steel industry for more than 100 years.

In continuous casting, steel is poured from the furnace into a ladle and then into a long tube-like vertical mould. The steel solidifies in billet form as it passes downward through the mould and is cut to desired lengths as it emerges. The process eliminates the stripping cranes, soaking pits, and blooming mill operations. Although still not in the commercial stage, the successful application of the principle of continuous casting to steel making, metallurgists agree, would be an outstanding achievement in steel technology.

Analysing the New England situation, Mr. Harter pointed out that the first decision would be whether a new steel mill should be fully integrated—that is, start with coal, iron ore and other basic materials—or start with the melting of scrap steel obtained locally. "This is a basic question," he said, "because, even though an economical supply of metallurgical coke may be available, cheap iron ore will not be available for two or three years. The investment required for an integrated steel mill of the same annual capacity would be two to three times that of the non-integrated mill."

He said that the newly developed mould for producing castings with a cross section of 100 sq. in., which will be tested during the coming year, will be constructed so that it can be enlarged.

New Steel Alloy Developed in U.S.

LARGE claims for technical and economic advantages are made in the U.S.A. for a new alloy steel, Carilloy TI, which the Carnegie-Illinois Steel Corporation has produced after four years' laboratory work. Its special characteristics are said to be exceptional strength for industrial or war uses, resistance to atmospheric corrosion approximately three times as great as that of ordinary carbon steels and retention of its mechanical attributes at sub-zero temperatures.

The company claims that Carilloy TI will effect savings in mobile equipment since it can be made in quantity in standard open hearth furnaces. It may be welded easily with electrodes now available, yet it possesses almost triple the strength of ordinary welding-grade structural steels.

In producing the new steel special attention was given to the conservation of costly and strategic alloying materials. Its strength is derived from the inclusion of small quantities of a comparatively large number of alloying elements which are readily available. No special equipment or procedures are necessary for its fabrication and welding does not adversely affect its properties While the new steel is basically a plate steel, it may be produced in other forms.

Technical Publications

ROTARY dryers with stainless steel shell and internal lifters specially designed for handling corrosive chemical materials and crystals are strikingly illustrated and described among the wide range of plant and machinery in "Typical Installations," latest publication of Ernest Newell & Co., Ltd., Misterton, Notts. Other products include calcining and handling plant for chemical work and fertiliser factories, coke oven plants, and slurry pumps. The volume which is well-printed and designed has also been published in Spanish and French.

* * *

AROMATIC solvents for insecticides and herbicides are described in technical service leaflet Number 1 now available from Petrochemicals, Ltd., London. DDT and BHC.90, and herbicides such as pentachlorophenol are readily soluble in aromatic solvents 23-5, 25-7 and 23-9. They are non-toxic and have high flash points.

* * *

COLOUR is inextricably associated with industry in countless ways. Knowledge of colour is based largely on the sciences of physics, chemistry and psychology. The current issue of "CIL Oval" (Vol. 19, No. 5) magazine of Canadian Industries, Ltd., is devoted entirely to this subject. In "Chemistry Accepts a Challenge", Dr. C. Y. Hopkins, head of the protective coatings section, Division of Applied Chemistry, National Research Council, Ottawa, shows how chemistry has identified various colour substances and forecast the development of new colours for future use.

* * *

ADVANTAGES of zinc chromate paints when used as primers on light metals and iron and steel are outlined in a new section of the revised and enlarged edition of "The Use of Zinc Pigments in Exterior Paints." It is issued by the Zinc Pigment Development Association and brings up to date the original test of 1947, demonstrating the versatility of the zinc formulations.

* * *

THE new edition of the "FBI Register of British Manufacturers" for 1950/51 is now available. The volume of more than 1000 pages, has a classified buyer's guide listing in alphabetical order 5000 products and services. There are a classified list of trade associations affiliated with the FBI and an alphabetical guide of brand and trade names. Each of the seven sections has an introduction in French and Spanish as well as English. The register (42s.) is published jointly by Kelly's Directories and by Iliffe & Sons, Ltd.

* * *

THE current issue of "The Nickel Bulletin" (Vol. 23, Nos. 8-9), published by the Mond Nickel Co., Ltd., London, is entirely devoted to abstracts from recently published information dealing with nickel and nickel alloys. Most of these refer to heat and corrosion resisting alloys. Particular attention is drawn to American work on heat-resisting properties of high-nickel and high-chromium steels.

* * *

PRACTICAL facts about Terylene polyester fibre, including its physical properties and resistance to oxidising agents, are given in a preliminary information brochure issued by I.C.I., Ltd. Among the other important properties indicated are high resistance to abrasion, light and weather, insect pests and attack by micro-organisms. Terylene does not support combustion and will burn only after prolonged application of heat.

* * *

INFORMATION relating to the safe handling of styrene monomer in its laboratory application, manufacture, transportation and storage are set out in a manual issued by the Manufacturing Chemists' Association, Inc., Washington, D.C. Particular attention is drawn to health, explosion and fire hazards and first aid and medical treatment.

* * *

"STANDARD Methods for Testing Tar and its Productions" (3rd edition, 30s. 9d. post paid) has been published by the Standardisation of Tar Products Tests Committee, London, and is expected to be available towards the end of this month. The 1938 edition has been thoroughly revised and the new work includes several tentative methods and a new section covering coal tar fuels.

* * *

DETERGENTS, soaps, water softeners, polishes and their manufacturers classified under headings London and country are given in "The Soap Makers' Directory, 1950" (3s. 6d., post paid 3s. 10d.) now obtainable from Simpkin Marshall (1941), Ltd. This edition which is of value to manufacturers of plant and machinery, also contains a list of candle makers in Great Britain.

OVERSEAS CHEMISTRY AND INDUSTRY

INDIAN MINERAL DEVELOPMENTS

Bauxite, Beryllium and Gypsum

GEOLOGICAL officials of the Government of India have estimated the bauxite deposits at Tungar Hill, in the Thana district of Bombay State, at about 100,000 tons, and further detailed examination has been recommended. These deposits are not likely to be exploited for the manufacture of aluminium in view of the existence of extensive reserves in the Belgaum and Kolhapur districts, which could be utilised in the near future. It is thought probable, however, that they may be used in the purification of Kerosene and in the manufacture of abrasives and refractories. Extensive resources of high-grade bauxite suitable for the manufacture of aluminium are also reported to exist in the hills about 15 to 20 miles north of the Korba coalfield, near Bilaspur. Preliminary surveys have been completed but the total quantity of bauxite available in this area has not yet been estimated.

Aluminium Prices

Manufacturers of aluminium goods in Bombay have told the Indian Tariff Board that, provided the Government brought about a decrease in the price of aluminium metal, they would be agreeable to governmental control over marketing prices of the finished articles or to co-operating in a thorough examination of the problem. Manufacturers said they did not agree that the protective duty had not adversely affected the demand for aluminium products. The comparatively higher cost of Indian aluminium goods as against those of British and other foreign manufacture in the overseas markets, it was stated, portended a danger that India might lose her market in South East Asia, the Middle East and Ceylon.

Fundamental research in felspar crystals is being carried out by Professor Raman, one of India's leading scientists, in his laboratory at Bangalore. Investigation is being made into the manner in which crystals irradiate in the process of separation of the different felspar components. The professor also proposes to carry out research in sugar technology. Support is already assured from the sugar manufacturers.

Occurrences of high-grade bauxite suitable for aluminium manufacture are reported some 20 miles north of the Korba coalfield, near Bilaspur, in the state of Madhya Pradesh. The Geographical Survey of India is also carrying out investigation of flux grade limestone at Mohtara, Jairanagar and Bilaspur, and samples are being analysed. White clays have been found in the Saoner, Nagpur and Anravati areas while magnet surveys are being carried out on the manganese ore deposits in the Balaghat district.

The wealth of minerals at Rajasthan was emphasised by Mr. N. V. Gadgil, Minister of Works, Mines and Power, Government of India, when he recently opened an exhibition at Jaipur. Exhibits included beryllium, calcite, coal, emeralds, gypsum, limestone, pink and white marble, and semi-precious stones.

U.S. Polystyrene Shortage

EXTREME shortage of polystyrene plastic raw material is reported to be having disastrous results for some plastic moulders in the U.S.A., according to the Society of the Plastics Industry, Inc., New York. Approximately 300 plastic injection moulders may be forced out of business. There are at present 900 plastic injection moulders in the United States.

Because of the great demand for polystyrene plastic products there has been a large expansion in the manufacturing facilities. Additional press capacity requires twice as much moulding powder and plants are still installing additional and larger equipment.

Allocations of the raw materials are based on last year's requirements, and some new injection plants are thus receiving no moulding powder.

Suppliers of the raw material were keeping abreast of demand until the all-out production of synthetic rubber created abnormal demand for styrene.

During the summer, plastic raw material manufacturers, operating at practically full capacity, produced 75.18 million lb. per month of all kinds of plastic moulding powders of which 23.13 million lb. was polystyrene. That is now being cut to 17 million lb. for moulding purposes, comparing with an anticipated requirement of 30 million lb. per month, when all the new moulding equipment now being installed is in operation.

DUTCH PRODUCTION

Progress in Antibiotics

FURTHER progress is reported in the Dutch antibiotic field. The Royal Yeast & Distillery Co., of Delft, which is a producer of penicillin, has started commercial production of chlorine-amphenicol, a drug of American origin effective against a number of diseases which penicillin does not control. The sales campaign for Dutch penicillin in other countries is to be pushed forward through another chemical firm, Organon, Ltd., of Oss, the foreign affiliates of which will act as agents for the product.

The Brocachemie, Ltd. (an associate of Brocades Stheeman & Pharmacia) has enlarged production of pora-amino-salicylic acid, the intention being shortly to supply most of the Dutch need of PAS, calculated to be some 9000 kg. a year.

Great headway has also been noted in the Dutch production of rock salt. Output of salt in 1939 amounted to about 200,000 tons and to 330,000 tons in 1949. The figures of the current year so far justify the expectation that around 400,000 tons (or double that of pre-war) should be obtained for 1950 by the Royal Dutch Salt Industry, Ltd. Production of salt-derived chemicals, which has been still further stimulated by the international implications of the stoppage in a large section of the American alkali industry in recent months, has also reached a record at Hengelo.

The record Dutch consumption of 145,000 tons of pure nitrogen during the last agricultural season, which again suggested the need for a large replenishment by import, is expected now to be replaced mainly by the greatly increased home production of the State mines.

Italian Coal Project

COAL imports to Italy are likely to be reduced from 800,000 to 650,000 tons a month if a Government scheme to increase the use of Sardinian coal is adopted. Considerable reserves are available at Sulcia where mining was expanded under the Fascist regime, but owing to its low grade and high cost there is little demand for Sardinian coal.

Modernisation of the mines is, however, being considered by the Ministry of Industry and Trade to increase output. Part of this increase would be used in a chemical fertiliser plant, the construction of which is being studied by a commission.

GERMAN STANDARDS GROUP

Measurement and Control Methods

THE growing importance of standards to chemical industry has recently been emphasised in many ways in Germany, particularly by exhibitions and other activities of the scientific instrument manufacturers. Further evidence of the increasing interest is supplied by the recent establishment in Germany of a Normenarbeitsgemeinschaft fur Mess—und Regeltechnik (NAMUR) in the chemical industry—a standards association for measuring and control methods. An account of its objects and policy is given by Dr. B. Sturn, of Leverkusen, in *Chemische Ind.* (1950, *2*, (11) 546-548).

This new standards institute has been established largely through the initiative of the Farbenjab Bayer, at Leverkusen. It does not intend to encroach upon or overlap the functions of the well-established standards institution DNI (Deutsche Norms. Inst.). Its purpose is rather to act in an advisory, consultative and critical capacity. More particularly it will try to interest chemical manufacturers in its work and to stimulate further adoption of standards and more accurate controls.

New Instruments

As its secondary objective NAMUR will again play a critical rôle in respect of new instruments and apparatus and improvements in existing types. Apparently this will include actual tests and inspection, for it is hoped to save the makers much expense in labour and research in marketing their new instruments. The aid of specialists may be invoked and lectures and discussions arranged. It is also hoped that supplementary questions, both physical and organisational, may be dealt with.

The work of the new association will be carried out through technical committees and sub-committees, classified according to the main divisions of physico-chemical factors concerned. The departments are described in some detail under 16 headings: temperature, fluid flow, pressure, *p*H moisture, and other determinations, gas analysis, general control technique, optical measurements, oscillation, explosion risks, viewing, sighting and dialling; recording drums; symbols, units, and formulae; rheological measurements (stresses, strains, deformations, etc.). Some of these are discussed in connection with already existing standards, and further improvements or changes are indicated.

The Chemist's Bookshelf

THE TRANSURANIUM ELEMENTS. Research Papers. Edited by G. T. Seaborg, J. J. Katz and W. M. Manning. 1949, New York: McGraw-Hill Book Co., Inc. London: McGraw-Hill Publishing Co., Ltd. 2 Vols. Pp. xxxvi + 860; xii + 873. 127s. 6d.

These two books are part of the National Nuclear Energy Series of about 60 volumes (4-14B). They appear as the result of work done under the Manhattan Project and the Atomic Energy Commission and contain over 150 original research papers dealing with the post-uranium elements and related topics.

In order to publish this material without undue delay the editing of individual papers has been very limited. As a result there are occasional discrepancies. Some are due to disagreement between individual determinations, while others arise from the early reporting of values which have subsequently been superseded by more precise figures. The entire series of papers has, in fact, been treated as a group of contributions to a journal of chemical or physical research.

These present volumes are largely concerned with the chemistry and physics of the synthetic elements neptunium (93), plutonium (94), americium (95) and curium (96). Plutonium receives most attention because of the great amount of work carried out on this element. In addition, a few papers about some of the natural heavy radioactive elements are included for reference convenience.

It might at first appear that this work would have a very limited appeal, but a short study of the contents shows that this is not so. Most of the papers will prove of interest and importance to any chemist dealing with research in pure inorganic chemistry and particularly to workers concerned with inorganic syntheses. Much of the material will be found to have a bearing on wider fields of work than those suggested by the title.

Of extreme interest is the clear indication of the importance of small-scale techniques in synthetic inorganic chemistry. A high proportion of the papers show that the work involved preparative operations on every scale, from centigram to microgram. Particularly fascinating are the accounts of the isolation and handling of microgram amounts of plutonium and neptunium when these elements were first investigated. The flowsheet in Paper 1.8, for example, starts from 90 kg. of irradiated uranyl nitrate as raw material, and gradually finds its way, after eight pages, to Fraction 45, 20 micrograms of plutonium hydroxide, and Fraction 46, 30 microlitres of a solution containing about 0.5 microgram of plutonium. The final comment on Fraction 46, " Retained for plutonium recovery," is sufficient indication of the immense skill involved in devising and handling the intricate techniques.

This aspect, however, is only one of many. A random selection of titles shows how wide and varied are the interests served. Among the most revealing are: Search for Elements 94 and 93 in Nature: The Chemical Properties of Elements 94 and 93; The Plutonium (iii)/(iv) Couple—Potential Measurements; The Tripositive Oxidation State of Plutonium; Complex Ions of Plutonium—Transference Measurements; Acid-Base Titrations of Plutonium (vi); Solubilities of Plutonium Trichloracetate in Various Reagents; The Vapour Pressure of Plutonium Halides; Composition of Plutonium (iv) 8-Hydroxyquinolate; Kinetics and Mechanisms of Aqueous Oxidation-Reduction Reactions of Neptunium; The Tracer Chemistry of Americium and Curium in Aqueous Solutions; Separation of Actinium from Rare Earths Using Ion-Exchange Resins; The Crystal Structure of NpO_2 and NpO; Electronic Structure of the Heaviest Elements and The Neptunium (4n+1) Radioactive Family.

Although these books are large they should wear well. The photolithographic method of printing is clear, and makes for easy reading. In particular, the numerous illustrations are pleasing and commendably clear.—C.L.W.

Book Received

THE EFFECTS OF ATOMIC WEAPONS. Dr. S. Glasstone and others. Revised 1950: U.S. Atomic Energy Commission. Pp. x + 456. $1.25.

OVERSEAS

Rubber Road Test in Ceylon

The first rubberised roadway in Ceylon has been laid from the main highway to the new laboratory of the Rubber Technologists in Katukuranda. The surface is constructed with varying quantities of rubber latex mixed with bitumen, and wear will be tested on different sections.

Particle Accelerator for Mexico

The High Voltage Engineering Corporation, Cambridge, Massachusetts, has been authorised to export a 2 million-volt Van de Graaff positive ion electrostatic accelerator to the National Autonomous University of Mexico in Mexico City. The U.S. Atomic Energy Commission states that the equipment does not contain any components of a secret nature.

International Textile Exhibition

Great Britain will show textile machinery and chemicals for dyeing at the International Textile Exhibition to be held in Lille from April 28 to May 20 next year. The wool centres of the British Commonwealth will be represented by the International Wool Secretariat. Firms from Belgium, Canada, Italy, Japan, Pakistan, Spain, Sweden, Switzerland and the United States will also be participating.

Rising Production in Western Germany

The mounting production of certain important chemicals in Western Germany is reflected by statistics for last August issued by the Office of International Trade, U.S. Department of Commerce. These showed (in metric tons, July figures in parentheses): Sulphuric acid, 100,479 (96,034); caustic soda, 29,603 (29,507); soda ash, 68,000 (62,000); calcium carbide, 59,333 (58,140); nitrogenous fertiliser, N content, 38,000 (37,700); and phosphatic fertiliser 27,000 (26,700).

New Aluminium Phosphates Bonding Agents

Aluminium phosphates bonding agents for refractories, high temperature cements and refractory paints are being produced in commercial quantities by the Monsanto Chemical Company, St. Louis, U.S.A. The products, ranging in ratio of aluminium to phosphoric acid from 1.0 to 1.67, and in physical form from dry solids to water solutions of high concentrations, have been given the trade name Alkophos. They are said to provide good green strength, making it possible to fire moulded shapes in place to yield high temperature non-slagging refractories.

Elemental Plutonium Found in Belgian Congo

The U.S. Atomic Energy Commission has announced the discovery of elemental plutonium in pitch-blende from the Belgian Congo.

Scientific Collaboration in Africa

The first session of the Scientific Council for Africa ended in Nairobi on November 26. One of the proposals considered worthy of further examination was the co-ordination of scientific, library and bibliography services.

Palestine Potash Agreement

The Government of Israel has contracted to lend the Palestine Potash Company $2.5 million, which, together with $5 million to be raised by the company, will be used for the replacement of plant and the building of a road from the southern end of the Dead Sea to Beersheba.

Aluminium Shortage

A deficit of 16,000 tons in aluminium supplies this year is estimated by ECA. Production is expected to reach 1.275 million tons, including 640,000 from the U.S.A., 380,000 from Canada, 225,000 from Europe and 30,000 from other countries. World consumption (excluding Russia and satellite countries) is estimated at 1.291 million tons which includes 820,000 by the U.S.A., 55,000 by Canada, 380,000 by Europe and 36,000 by other countries.

Pakistani Scientific Education

The six-year development plan of the Government of Pakistan, which is estimated to cost Rs.2600 million, includes a projected expenditure of Rs.92 million on the subsidisation of fertilisers and manures. The plan also provides for Rs.50 million on account of the training overseas of Pakistani scholars in technical and scientific subjects, and Rs.40 million for the setting up of polytechnics, laboratories, etc.

Australian Plastics Expansion

The Beetle-Elliott company, of Sydney, has acquired Australian patent rights for melamine resins and moulding powders, in which much interest has been shown by the Australian plastics industry. The resins are being made at the company's plant at Rozelle, N.S.W. The company's general manager, Mr. Bonnett, is visiting European countries to study the most up-to-date methods of manufacturing the powder form in Australia and the company intends to expand its plant for this purpose.

OBITUARY

A LEADER OF INDUSTRY

Tribute to Sir Frederick Bain

Sir Frederick Bain

CHEMISTRY and industry lost a great leader in the passing of SIR FREDERICK BAIN, M.C., deputy chairman of Imperial Chemical Industries, Ltd., who died in a London hospital last week.

Sir Frederick, who was 61, had been taken ill at a farewell dinner to the American ambassador Mr. Lewis Douglas.

Born in Macduff, Banffshire, he had his early education at Banff Academy. It was hoped to send him to a university, but any chance of this was lost by the death of his father when Frederick Bain was only 17 years of age. Young Bain went into a fertiliser business in Aberdeen, where he so impressed his employer that he was allowed to attend afternoon lectures at the University.

During the 1914-18 war he served with the Gordon Highlanders and was twice wounded, resulting in the loss of an arm. He was twice mentioned in dispatches and awarded the M.C. When only 27 his abilities were transferred to another sphere and he became, in 1916, Deputy Director of Chemical Warfare Supply at the Ministry of Munitions.

War-time Appointments

After the war he joined the United Alkali Company, one of the four concerns which in 1926 merged to form Imperial Chemical Industries. When war again broke out, in 1941 he was appointed chairman of the Chemical Control Board at the Ministry of Supply and a year later he became chairman of the Chemical Planning Committee at the Ministry of Production.

Sir Frederick was a statesman among industrialists always with an outlook wider than his own firm. He was on the best of terms with politicians of all parties, with eminent scientists and university teachers. It was he who, as president of the Federation of British Industries, persuaded Sir Stafford Cripps to let him try to obtain a voluntary agreement from industry when the chancellor wanted to limit dividends by law.

Whatever he undertook he threw himself into it wholeheartedly. To the last he took a keen interest in the Anglo-American Council on Productivity, which he had helped to set up. He was keenly interested in any scheme from staff welfare to research projects.

Many public tributes have been paid to this man of abounding spirit, who besides being a chemist and an able administrator, was a master of literature, with a love of Burns, Milton and Shakespeare and a wide appreciation of contemporary writers.

Lord McGowan, chairman of I.C.I., wrote in *The Times*:—

The passing of Sir Frederick Bain, after a very short illness, leaves a blank in the lives of his innumerable friends that will not be filled. He was the possessor of a rare brand of personal magnetism that attracted people to him in every walk of life, and they were never disappointed.

He was infinitely kind and generous, had a great zest for life, loved its beautiful things—its books, and plays, and poetry—and lived with all the dash and elan of the Gordon Highlander that he was. He rapidly overcame the physical disability caused by the loss of his arm in the first World War. It did not affect his spirit—he was always unquenchably cheerful.

He was a prodigious worker, not only for our company but on Government committees, where his experience was of the greatest value. His enthusiasm had the quality of wildfire, and could be relied upon to engulf all those with whom he came into contact. He was a tower of strength in our organisation, and in his passing we suffer a grievous loss.

Sir Frederick had travelled a great deal, and his wonderful faculty for making friends in foreign lands served to cement invaluable trade relationships, not only for I.C.I. but for the British nation. He will be much mourned as a personal friend not only within our own organisation but by countless people not directly associated with it.

· HOME ·

Agar-Agar from Japan in 1951

The Ministry of Food has announced that a limited quantity of agar-agar may be imported from Japan under individual licence, up to June 1951.

Lord Leverhulme Memorial Window

A memorial window to the late Lord Leverhulme was unveiled by Sir Geoffrey Heyworth, chairman of Lever Bos., and Unilever, during a special service at Christ Church, Port Sunlight, on November 26. The window was voluntarily paid for by Port Sunlight workers.

Possible Shortage of Nitrogen

It is estimated that consumption of nitrogen will exceed production by 35.000 tons in the year ending June 30, 1951. In its annual report on the nitrogen industry Aikman (London) estimates that stocks at June 30 next are likely to be not more than 285,000 tons, equivalent to 23 days supply.

Fatal Explosion Unexplained

The cause of the explosion in one of the mixing huts of Explosives and Chemical Products, Ltd., at Bramble Island, near Harwich, on November 6 in which four men lost their lives remains unknown. At the resumed inquest at Harwich last week the Home Office inspector, Major W. Crawford, said there was no evidence of any kind to show what was the cause and he did not think anyone would be able to throw any light on it. A verdict of "Acci dental death" was returned.

Donations to Leeds University

Donations and grants acknowledged by the council of the University of Leeds last week, were: £250 from I.C.I., Ltd., to the department of biomolecular structure; £225 from the United-Steel Companies, Ltd., Sheffiield, and £225 from Stewarts and Lloyds, Ltd., Corby, to the department of physics; £500 a year for two years from Albright and Wilson, Ltd., Birmingham, for the encouragement of analytical chemistry, to the department of inorganic and physical chemistry; £250 and equipment from I.C.I., Ltd., and £50 from the Society of Dyers and Colourists for the purchase of apparatus for the department of colour chemistry and dyeing; and £510 from the Agricultural Research Council for research to the department of agriculture.

New Chemical Factory

Sentinel Products, Ltd., of 12 St. Andrew's Grove, London, N.16, is planning a new factory at Southend, Essex.

KID Exemptions for December

The following chemicals have been exempted from Key Industry Duty for the period December 1-31, 1950: 2-(*p*-acetamidobenzene-sulphonamido)-pyrimidine; benzene hexachloride; phenylmercury acetate.

Coal Production

There was a slight drop in deep-mined coal production last week and a more substantial fall in opencast output. Comparative figures are: Last week: 4,350,100 tons (deep-mined 4,212,500 tons, opencast 137,600 tons). Previous week: 4, 4,435,700 tons (deep-mined 4,214,100 tons, opencast 221,600 tons).

Cosmic Ray Research in the Stratosphere

The Bristol University research team, under the direction of Professor C. F. Powell, is to use large balloons to investigate high-energy particles in the stratosphere. The balloons, some of which will be 200 ft. in diameter, will carry special photographic plates to a height of 22 miles so as to record the tracks of atomic particles during their passage through matter.

Spasmodic Tin Prices

After a slight rise on November 21 cash was dealt in at £1125 in the closing session, with three months sold at £1060 and mid-February at £1065. The market was uncertain and quiet on following days and prices fell again on November 27. In the afternoon there was a turnover of 45 tons, cash being sold at £1000 and three months quotations hardening slightly to £925. A sharp rally on November 28 raised the cash price to £1117 10s., with three months £985-£995.

Unlicensed Explosives

For offences against the industrial explosives regulations, Arnott, Young and Co., Ltd., Fullarton Iron Works, Carmyle, were fined £10 at the Airdrie Sheriff Court last week, and one of their workmen, Fred Parven, was fined £5. The firm was admitted to have a licence for only 10 lb. of explosive and to have kept in an office 68¾ lb., although it was fully ten years since it had used explosives.

Next Week's Events

MONDAY, DECEMBER 4

O.C.C.A.

Hull: Royal Station Hotel, 7 p.m. F. C. Stephen: "Insulating Varnishes."

Incorporated Plant Engineers

London: John Adam Street, Adelphi, W.C.2. 7 p.m. W. K. B. Marshall: "Arc Welding."

Society of Chemical Industry

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1. 6.30 p.m. A. R. Powell: "Germanium and Gallium."

TUESDAY, DECEMBER 5

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. J. R. Boundy and S. G. Bergen: "An Electronic Process Controller."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1. 5.30 p.m. J. M. Coulson and J. H. Ellinger: "A Nomograph for the Calculation of Heat Transfer Coefficients for Convection without Change of Phase." H. R. C. Pratt: "The Application of Turbulent Flow Theory to Transfer Processes in Tubes Containing Turbulence Promoters and Packings."

WEDNESDAY, DECEMBER 6

Royal Institute of Chemistry

Widnes: Municipal Technical College, 7 p.m. "Radiation and Light Sources for the Chemist."

Institute of Petroleum

London: 26 Portland Place, W.1, 5.30 p.m. "Spectroscopic Methods in Hydrocarbon Research." Papers by J. G. Reynolds, Dr. N. Sheppard and Dr. W. C. Price.

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1. (Food Group with the Society of Public Analysts and Other Analytical Chemists). H. C. S. de Whalley, N. Albon and D. Gross: "Applications of Paper Chromatographic Methods in the Sugar Industry."

Physical Society (Low Temperature Group)

London: Science Museum, S.W.7, 5,30 p.m. (Members of the Institution of Chemical Engineers invited). R. Waugh: "Reciprocating Expansion Engines"; E. and P. E. F. Crewdson: "Development of Air Expansion Turbines"; G. G. Haselden, M. W. Reis and N. P. W. Moore: "A New Rotary Expansion Engine."

THURSDAY, DECEMBER 7

Royal Institute of Chemistry

Bristol: The University, Woodland Road, 7 p.m. (Bristol and District Section, with CS, SCI and CEG) A. W. Morrison: "Carbon as a Material of Construction."

Durham: University Chemical Laboratories, South Road, 7.45 p.m. (With SCI) Professor C. A. Coulson: "What is a Chemical Bond?"

Falkirk: Lea Park Rooms, 7.30 p.m. R. E. Willmott: "Manufacture of Yeast."

Chemical Engineering Group (SCI)

Bristol: University, Woodland Road, 6.30 p.m. A. W. Morrison: "Carbon as a Material of Construction."

FRIDAY, DECEMBER 8

The Chemical Society

Hull: University College, 6 p.m. (With RIC) Professor John Read: "Chemical Personalities a Century Ago."

Birmingham: The University, Edgbaston, 4.30 p.m. Professor D. H. Hey: "Homolytic Aromatic Substitution."

Newcastle: Bedson Club Lecture, Chemistry Department, Kings College, 5 p.m. Professor H. J. Emeléus: "The Application of Halogen Fluorides in Preparative Inorganic Chemistry."

Royal Institute of Chemistry

Dundee: Royal British Hotel, 7 p.m. Messrs. Watson, Merry and Wylie: "Bituminous Products, Production and Control."

Glasgow: Royal Technical College, George Street, C.1, 7.15 p.m. Sir Wallace Akers: "Problems in the Production of Useful Power from Atomic Energy."

Society of Chemical Industry

London: Chemistry Lecture Theatre, Kings College, Strand, W.C.2, 7 p.m. Dr. W. J. Arrol: "The Preparation of Radio-Active Materials in the High Degree of Purity."

Bradford Chemical Society

Bradford: Technical College, 7 p.m. Dr. G. F. Wood: "Some Interesting Flow Phenomena."

O.C.C.A.

Manchester: The Engineers' Club, Albert Square, 2 p.m. Dr. R. R. Goodall: "Partition Chromatography."

The Stock and Chemical Markets

NEWS from Korea, and Mr. Gaitskell's warning of still higher taxation to come, made stock markets less active this week, although industrial shares held all but a small part of recent gains. British Funds were inclined to firm up awaiting the decision as to whether there is to be a conversion offer in respect of National War Bonds (1951-53).

There are more indications that 1951 will be a very difficult year for industry because of rising prices and the probability that many essential materials will be rationed because of the priority requirements of rearmament and export trade. Many companies are in need of additional capital to meet the mounting cost of stocks. In many cases the uncertain outlook makes it impossible to issue ordinary shares. The market thus expects that the new money will have to be raised by means of preference shares and other prior charges ranking in front of ordinary shareholders. Nevertheless, many industrial shares are attractive at current prices and that despite future uncertainty most leading industrial companies have reasonable prospects of maintaining dividends at last year's rates. Many of last year's dividends were much below actual earnings on the shares; and there would have to be an exceptionally heavy fall in profits to lower the dividends next year.

Chemical and kindred shares have not held recent best levels, but movements generally were not more than a few pence. After changing hands at 43s. 3d., Imperial Chemical eased to 43s., while Fisons, at 25s. 6d., receded a little further. Monsanto, at 51s., were steady. Albright & Wilson (at 30s. 9d.) were held tightly because of the projected bonus, the terms of which were announced when the preference shares issue was made. Boake Roberts 5s. shares were 34s. 9d., Brotherton, 21s. 3d., and F. W. Berk 2s. 6d. shares, 12s. 9d. Laporte Chemicals 5s. units were 10s. 3d., Lawes Chemical, 11s., and Major & Co., 3s. 3d. Amber Chemical 2s. shares were 2s. 9d., Bowman Chemical, 6s. and Pest Control, 7s. 4½d. W. J. Bush were 77s. 6d. "ex" the bonus shares. Calor Gas shares firmed up to 21s. 3d. following publication of the full report and accounts.

Despite higher dividend hopes, Turner & Newall eased to 86s. but United Molasses have been active around 48s. and the 4s. units of the Distillers Co. were well maintained at 19s. 6d. Associated Cement, however, came back to 79s. 9d., and Dunlop Rubber to 55s. 1½d.

There was again good demand for colliery and coke-oven shares on latest market estimates of break-up values. British Benzol rose further to 88s. 9d. and Powell Duffryn were 32s. 3d. Allied Ironfounders, at 50s. 9d., responded to the increased interim dividend. Higher dividend hopes have attracted some attention to Goodlass Wall shares which further strengthened to 39s. 6d. Tube Investments at £6½ were firm on the view that shareholders will have preferential allotment in the forthcoming preference share offer.

Boots Drug, at 49s. 9d., strengthened after an earlier small decline. Glaxo have remained active at slightly over 60s., partly on market talk of higher dividend prospects. Triplex Glass were active at over 28s. and United Glass Bottle showed firmness at 77s. 6d. General Refractories again moved higher, at 24s. 9d.

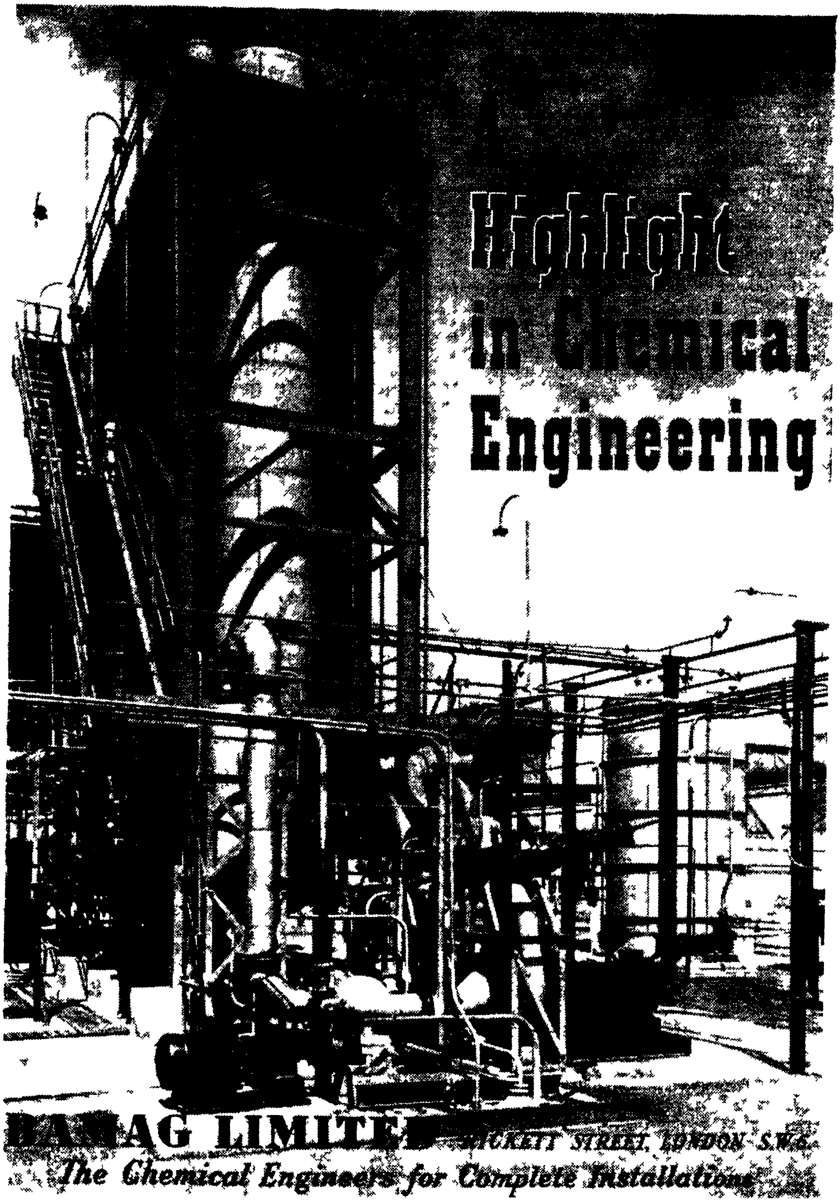
Oils were uncertain, Shell eased after touching 70s. while Anglo-Iranian were dull on fears of fresh Persian opposition to the royalties agreement.

Market Reports

AN active demand, both from home users and for shipment, continues for most items in the industrial chemicals market and there have been no important price alterations during the week. Soda products generally remain in good call and all available supplies of potash chemicals are quickly absorbed. A steady trade is reported in formaldehyde, bleaching powder and hydrogen peroxide. White and red lead are in good request at unchanged rates. Business in coal tar products continues brisk, with buying interest in most items fully sustained.

MANCHESTER.—A steady demand for heavy chemical products continued on the Manchester market during the past week. Almost a full range of alkalis are being taken up by home users in substantial quantities. There have been fresh inquiries for alkalis from exporters. Ammonia, potash and magnesia compounds, as well as many miscellaneous chemicals are also in demand. Moderate new business has been placed in fertilisers. There has been activity in most tar products and a further stiffening of prices of American

(continued at foot of page 796)


Highlight
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Engineering
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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ABARDALE MANUFACTURING CO., LTD., Brighton, manufacturers of waxes, etc. (M., 2/12/50). Oct. 19, £300 debenture, to W. V. Meyrick, Sanderstead; general charge.

ARISTON ALLOYS, LTD., Croydon. (M., 2/12/50). Nov. 1, mortgage, to Martins Bank, Ltd.; charged on factory premises at Mill Lane, Croydon, with plant, machinery, etc.

GLENDON PLASTICS, LTD., London, W.C. (M., 2/12/50). Oct. 31, £1000 deb., to C. C. Stewart, Chingford; general charge.

LEA VALLEY CHEMICALS, LTD., London, E.C. (M., 2/12/50). Oct. 18, £15,000 (not ex.) debenture to Courtaulds, Ltd.; general charge.

MEDICO BIOLOGICAL LABORATORIES, LTD., London, S.E. (M., 2/12/50). Oct. 27, £6500 debentures; general charge. *Nil. Feb. 10, 1947.

Satisfactions

DAVIS & DAVIS (MALDEN), LTD., New Malden, chemists. (M.S., 2/12/50). Satisfaction Oct. 24, of charge registered Dec. 21, 1945.

WELTON LABORATORIES, LTD., Bradford. (M.S., 2/12/50). Satisfaction Oct. 26, of mortgage registered Jan. 1, 1948.

New Registrations

Dabitoff Co. (London), Ltd.

Private company. (488,158.) Capital £1000. Chemical manufacturers, druggists, drysalters, oil and colour men, etc. Subscribers: W. B. T. Johnson, W. Ivimey. Reg. office: 12 Devonshire Row, Bishopsgate, E.C.2.

Denton & Jutsum (Sales), Ltd.

Private company. (488,621). Capital £100. Manufacturers of varnish, enamel, shellac, cellulose, oils, etc. Subscribers: A. Gray and J. Tobin. Solicitors: Franks, Charlesley & Leighton, 21 Ely Place, E.C.1.

Greenford Chemicals, Ltd.

Private company. (488,583.) Capital £1000. Chemists, chemical manufacturers, etc. Directors: L. Sargeant, J. W. Hardy. Secretary: M. Morgan. Reg. office: Aintree Road, Perivale, Greenford, Middlesex.

D. J. Simpson (Chemist), Ltd.

Private company. (488,622). Capital £3000. Manufacturing, pharmaceutical, general chemists, etc. Directors: W. Pearce and D. J. Simpson. Reg. office: 101 Warwick Road, Kenilworth, Warwicks.

Potters Hygienic Products (London), Ltd.

Private company. (488,690). Capital £50,000. To manufacture and acquire for resale all classes of chemicals, varnishes and stains, etc. Directors: C. R. Potter, M. M. Potter, H. Flack, W. F. Chapman and G. M. Catanach. Reg. office: 81 High Street, Great Dunmow, Essex.

Spanish Shale Oil

FACILITIES in the Puertollano area of Ciudad Real Province, Spain, where oil shale has been mined and retorted and shale oil refined commercially since 1922, are capable of producing 1.6 million barrels of crude oil yearly, according to a report just released by the U.S. Bureau of Mines. The Puertollano plant, about 125 miles south of Madrid, was one of a number of foreign commercial oil-shale establishments visited by the Bureau's technologists as part of its synthetic liquid fuels programme. The oil-shale deposit contains an estimated 100 million tons of mineable shale, and the present run-of-mine shale has an average assay value of 36 gal. of oil a ton, the report states Spain's total annual demand for crude oil has been 7.5 million barrels in recent years.

THE STOCK AND CHEMICAL MARKETS

(continued from page 794)

duty-free cresylic acid. Pyridines are firmer.

GLASGOW.—Business remains steady in the Scottish chemical market this week although restrictions are becoming more noticeable. The export market is reacting badly owing to the fact that home demands are now taking up a greater proportion of the chemicals which were formerly exported.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Air-or gas-containing soap and the production of the same.—D. E. Marshall. April 30 1946. 646,060.

Apparatus for melting glass and the like.—Union Des Verreries Mecaniques Belges Soc. Anon., G. Henry, and E. Brichard. Dec. 30 1947. 646,000.

Apparatus for the separation of gaseous or vaporous mixtures.—I.C.I., Ltd., S. Labrow, E. W. Charlton, A. Craig, and E. V. Appleton. June 22 1945. 646,352.

Integral masking of photographic silver-halide emulsions with azo substituted coupling components.—General Aniline & Film Corporation. May 1 1946. 646,367.

Process for producing aldehydes. G. Natta, and E. Beati. Aug. 7 1946. 646,424.

Production of alcohols.—I.C.I., Ltd., N. Levy, and R. K. Greenhalgh. Aug. 15 1947. 646,284.

Production of alcohols.—I.C.I., Ltd., N. Levy, and R. K. Greenhalgh. Aug. 15 1947. 646,497.

Separation of tantalum and niobium in mixtures of their oxides.—Soc. Generale Mettallurgique de Hoboken, and J. P. Leemans. Feb. 18 1947. 646,375.

Photographic developer.—General Aniline & Film Corporation. Feb. 28 1947. 646,376.

Concentration and reduction of iron ore.—Titan, Co. A/S. June 17 1947. 646,289.

Solid detergent masses.—I.C.I., Ltd., and F. J. Pollak. May 31 1948. 646,434.

Manufacture of rubber hydrochloride film for packing foodstuffs.—Wingfoot Corporation. Aug. 1 1947. 646,291.

Diazotype material comprising monoalkyl and hydroxyalkyl N-substituted-*p*-diazo aniline as light sensitive agent.—General Aniline & Film Corporation. Oct. 13 1947. 646,444.

Manufacture of bimetallic material suitable for use in the production of bearing elements.—Cleveland Graphite Bronze Co. Nov. 8 1947. 646,506.

Production of organohalosilanes.—J. G. Fife. (Dow Corning Corporation). Oct. 28 1948. 646,584.

Production of anthraquinone derivatives.—British Celanese, Ltd. Dec. 22 1947. 646,459.

Process for the manufacture of vitamin-A compounds.—N.V. Organon. Dec. 22 1947. 646,586.

Process for refining, degasifying, and correcting the composition of light metals and light metal alloys under a salt bath. V. Sterental. Dec. 24 1947. 646,587.

Production of organohalosilanes.—J. G. Fife. (Dow Corning Corporation). Nov. 3 1948. 646,466.

Inhibition of foam formation during the manufacture of pulp or paper.—Nopco Chemical Co. Jan. 15 1948. 646,467.

Methods of making porous cemented carbide.—British Thomson-Houston Co., Ltd. March 5 1948. 646,522.

Manufacture of bodies composed predominantly of carbon.—C.D. Patents, Ltd., and A. Hilliard. March 7 1949. 646,524.

Methods of resolving chlorosilane mixtures.—British Thomson-Houston Co., Ltd. March 23 1948. 646,481.

Process for the preparation of dibenzylmethylamine.—Soc. Belge De L'Azote et des Produits Chimiques du Marly. March 23 1948. 646,594.

Sintered metal alloys of the hard metal or hard metal carbide type.—F. C. Potts. (Stora Kopparbergs B/A.). April 3 1948. 646,530.

Manufacture of derivatives of 3:5-dioxopyrazolidine.—L. E. Jones. (J. R. Geigy Soc. Anon.). Feb. 24 1949. 646,597.

Generation of hydrogen containing synthesis gas.—Hydrocarbon Research, Inc. April 10 1948. 646,532.

Ultra-violet radiation emitting phosphors.—British Thomson-Houston Co., Ltd. April 14 1948. 646,533.

Manufacture of bodies composed predominantly of carbon.—C.D. Patents, Ltd., and A. Hilliard. March 7 1947. 646,534.

Fluorescent or phosphorescent compositions.—British Thomson-Houston Co., Ltd. April 15 1948. 646,535.

Amended Specifications Published

Synthetic resin moulding compositions and articles made therefrom.—J. Ferguson & Sons, Ltd., and another. 582,807.

Production of colour effects on or in the oxide film of anodised aluminium or aluminium alloy.—W. J. Campbell. 593,289.

Methods and compositions for killing weeds.—American Chemical Paint Co. 598,072.

Heating and reheating of ferrous metals.—J. Miles and Partners (London), Ltd., and another. 606,401.

Process for the recrystallisation of melamine.—Ciba Ltd. 628,681.

The
Chemical Age
The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Volume LXIII 9 December 1950 Number 1639

Attacking the Tower

IN his speech at last week's annual dinner of the Royal Society, the new president, Professor E. D. Adrian expressed some concern about scientists becoming unintelligible to one another. Science was building a "Tower of Babel" and he laid some of the blame for this upon the paper shortage. "If you are bubbling over with information and have to get it all into half a column, it is a great temptation to speak of Compound E when what you really mean is 17-hydroxy-dihydro-corticosterone," he said.

There must be many laymen who found this comment somewhat puzzling though they may also have derived a little satisfaction in learning that an age-old external problem of science—unintelligibility—has begun to manifest itself internally. This modern custom for replacing complex chemical names with simpler contractions is a stride towards better and easier understanding. It is surely a minor consequence if a small number of scientists would appreciate the meaning of a sentence that spoke of 17-hydroxy-dihydrocorticosterone more rapidly than one that spoke of Compound E; and this disadvantage is remedied easily enough by looking up the more precise name and formula for the substance. Indeed, if it is the paper shortage that has encouraged this tendency, then a very ill and long-suffered wind in our way of life has produced at least one benefit. But, in fact, the drive for shorter and simpler names has been most powerful in the United States, a country where paper is lavishly abundant.

Clearly Professor Adrian fears the invasion of scientific literature by these popular substitutes for proper names and terms. There is undoubtedly some danger that precision and accuracy will be gradually eroded. Two safeguards can avoid these consequences. First, there should be an internationally agreed list of names to ensure that they are properly used *e.g.*, to ensure that DDT will be used only for dichloro-diphenyl-trichloro-ethane. Second, in all scientific papers the first use of the contracted name should be followed with the bracketed or foot-noted presentation of the precise chemical name. If these two conditions were always applied, it is difficult to see how any disservice will be done to science and its clear exposition.

Today it is possible for one complex organic substance, or a related group of such substances, to become the foundation of a new branch of applied science and chemical manufacture. It

is essential to make verbal compromises. Innumerable people must refer to the substance or substances very frequently and no more than a handful of them will be organic chemistry linguists brought up on a diet of structural prefixes and suffixes. The chemical engineer will often have an important part to play in the production of such materials and even he will shrink from di-, tri-, para-, and ortho-symphonies. Let it not pass unnoticed that even chemists have had to compromise among themselves. In the example just quoted, dichlorodiphenyl-trichloroethane is a deplorable contraction for *a-a*-bis-(*p*-chlorophenyl) - β - β - β - trichloroethane. Professor Adrian spoke of a "Tower of Babel," but there is a more refined quota of unintelligibility within that older tower of science, the Ivory Tower. It is true that Compound E is a popular term without self-evident meaning to the organic chemist; but when properly used it enables more people, including doctors, to read literature about it without mental discomfort. Centuries ago Hippocrates observed that "if you miss being understood by laymen, you will miss reality."

No one would deny that the introduction of easier names presents new problems. One is the difficulty in distinguishing between such names and trade-names. In the modern insecticide industry the rapid development of a number of synthetic chemicals has created several confusions of this kind. In America, benzene hexachloride is BHC; when produced with a high content of the gamma-isomer the name "lindane" is now used. Here the trade-name "Gammexane" has frequently been used for benzene hexachloride or BHC, and now, when the more refined gamma-product is also available, "Gammexane" is still tending to be used. So long as this source of confusion is confined to commercial literature, little harm is done; it begins only when the same twofold meaning slides into scientific literature. Yet the remedy is easy enough. The scientists writing for other scientists can avoid the use of the trade-name and use the full chemical name or the more widely accepted contractions, BHC and lindane. A trade-name is not created for scientific purposes.

The danger of a "Tower of Babel" was greater in the early period of finding shorter names for organic synthetics. The fashion for letter combinations and numbers can now be

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On Other Pages

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Notes and Comments

Chemistry at the Festival

SCIENCE will play a major part in the displays at the Festival of Britain Exhibitions; in particular chemistry will get a very good showing. Both in terms of fundamentals and of industrial products, British contributions to this science will be made manifest in a luxuriant diversity of ways. In a recent interview with a group of science writers, Mr. Cox, Science Director of the Festival, outlined something of the basic ideas, content and methods of the scientific displays.

At the South Bank site—the best known of the Festival's Exhibitions—two principal " circuits " have been laid out, based on " The Land and the People." In the former, displays of the geology and the natural resources of the land will lead naturally into a pavilion devoted to our manufacturers. Here, examples from the rich range of British chemical products will be displayed alongside those of other industries. Meanwhile in the agricultural sections our pioneering researches in the applications of synthetic fertilisers will be shown rounded off by a photomontage of a modern phosphate factory. Here too, the contribution of selective weed killers to our rising agricultural productivity is illustrated by reference both to the hormone and the " straight " type of agent. In the massive central Dome of Discovery, which tends to dominate this part of the site, is evidence of British discovery in theory and practicability. Models portraying the atomic theory will have their practical counterparts in the displays of dyestuffs, photography, plastics and the uses of the rare gases. British industry has contributed much and pioneered widely in the internationally cross-fertilised field of chemistry. Here a part of the story is told—but gracefully, without stridency and with due acknowledgement of contributions in all parts of the world which we have helped and which have helped us.

Teaching Fundamentals

AMONG the many assets which will remain with us after this eventful Festival, will be the enormous strides in educational methods which have resulted from special researches in this field. The devices employed to capture and sustain attention, and to drive home points to the most apathetic are powerfully compelling. In the Science Section at South Kensington, housed next to the Science Museum, there is (for example) a unique presentation intended to show relative levels of the analysis of matter. Theme for this show is an ordinary so-called lead pencil. In a sequence of four rooms, visitors are led into an Alice-in-Wonderland illusion of growing smaller until they are of sub-atomic size. At this stage, they can meet atomic models so to speak as equals, the visitors having diminished in size by a factor of roughly 10^{10}. What does this mean in terms of chemical and allied fundamentals? At the stage of one-tenth reduction, in the first room, they merely see a pencil enlarged; in the second room, they see only the tip a thousand times enlarged, but in the third they begin to learn the crystallography of graphite, for here the characteristic layer structure is shown in the way the trace is made on the paper. At the 10^{10} stage wave mechanic models take the visitor into a deep understanding of the intra-atomic structure. And throughout, in a blended, unified whole, sound and surroundings are combined to create this valuable didactic illusion. Truly, a new generation should emerge from displays like these, one grounded in basic physics and chemistry and fully able to appreciate the achievements of the chemical industry.

Zinc Rationing in 1951 ?

EVIDENCE of the increasing shortage of non-ferrous metals is afforded in the announcement by the Ministry of Supply on November 29 that consideration is being given to an allocation scheme for virgin zinc in the new year. The Minister of Supply, Mr. G. R. Strauss, in reply to further questions, told the Commons on December 4 that "a statement on the supply position will be made shortly."

At present the allowance to consumers has been cut to 90 per cent of their 1949 deliveries, which, based on current consumption represents a reduction of about 25 per cent. When this cut was first made, on October 1, some consumers of zinc, had already used 90 per cent of their 1949 deliveries and, in effect, were not entitled to further supplies this year, although certain concessions have since been made.

It will be remembered that an announcement from the U.S.A. in November indicated that U.S. stocks of zinc are now the lowest for 25 years, although domestic output is the highest since 1944. Meanwhile, the U.S. Government has stated that civilian consumption of zinc is to be cut by 20 per cent in January 1951.

New Industrial Chemical

CROTONALDEHYDE is a clear, almost colourless liquid with a sharp, penetrating odour. It has a boiling point (760 mm.) 84-85° C., and a flash point 66° F., the freezing point is −75.9° C. The aldehyde is soluble to a limited extent in water, but insoluble in most common solvents, such as ethyl alcohol, ethyl ether and benzene. Crotonaldehyde is itself a valuable solvent and readily dissolves vegetable and mineral oils, varnishes, shellac, resin, waxes, synthetic resins and rubbers.

As a member of the reactive aldehyde family, and containing a conjugated double bond system, crotonaldehyde is an important intermediate finding use in the synthesis of many organic chemicals, synthetic resins, dyestuffs and latterly the man-made pyrethrins. The following are the most important developments in this field :—

(1) Oxidation of the aldehyde produces crotonic acid or maleic acid used in alkyd resins.

(2) Reduction of crotonaldehyde gives n-butyraldehyde needed for the synthesis of butyric acid or higher alcohols by the aldol condensation. Butyric acid is assuming importance as raw material for plastics manufacture, e.g., cellulose acetate butyrate.

(3) Condensation of the aldehyde with aromatic amines gives a wide range of potentially important chemicals, some of which are finding use as rubber vulcanisation accelerators, synthetic resins and substituted quinolines.

(4) Crotonaldehyde is recommended as a denaturant for alcohol and as a warning agent in detecting gas leaks.

(5) In the processing of lubricating oil the aldehyde is finding some use as a special solvent to remove resinous or gummy impurities.

Crotonaldehyde is a dangerous chemical owing to its inflammability and active lachrymatory character. Painful blisters are formed when the liquid comes in contact with the skin.

ATTACKING THE TOWER

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seen as a regrettable mistake. DDT and BCH enjoyed a short period of isolation in their own field; then came HETP and TEPP, MCPA, 2,4-D, DD, etc. Even wartime and post-wartime organisations were not more alphabetical. It is essential that a familiar contraction should be easily memorable and the more recent fashion for coining new and fairly fluent names is a great improvement. For example, cortisone is very much better than Compound E; and allethrin, the name coined in U.S. for the synthetic analogue of one of pyrethrum's constituents, is much superior to any combination of letters or numbers. The pronounceable name will make its mark in the memory; innumerable combinations of letters or numbers require directories.

For so many purposes it is convenient to make use of these simplified names. The tide cannot be turned back nor can a sharp frontier between popular and scientific usage be set up. International agreement at an early stage in the development of a new and possibly important substance is required as a safeguard against confusion. But protracted debates on and between innumerable committees to decide which is the most suitable of several names should be avoided; a rose by any other name would smell as sweet.

METHODS OF ESTIMATING MOISTURE

Following is a summary of a paper presented by Alan H. Ward, B.Sc., A.R.I.C., to The Institute of Fuel, in London on Tuesday, 5th December.

"MOISTURE content" would appear to imply a most elementary analytical determination, although in practice it may well be one of the biggest sources of disagreement between different laboratories. This arises from the complex relation between water and the substance with which it is associated. Free moisture is normally present in all materials but in addition water may also be adsorbed or otherwise physically bound to organic substances, particularly colloids. Furthermore, the elements of which water is composed, namely hydrogen and oxygen, are components of the main organic constituents of matter—carbohydrates, protein and oil. Thus, when assessing moisture content, one has to take into consideration water in three separate states—free or surplus moisture, physically bound moisture and the chemically combined elements of water.

Roughly the Same Properties

Except in the presence of relatively large amounts of soluble material, free moisture has roughly the same properties as ordinary water as regards vapour pressure, boiling-point, etc. Adsorbed moisture is quite different. Its vapour pressure is markedly lower and colloids will not part with all their moisture when heated to temperatures well over 212° F. or when subjected to desiccating agents or to vacuum treatment.

The chemically combined elements of water can, of course, only be driven off when actual decomposition occurs. With most organic materials, other than pure substances, there is no definite temperature at which decomposition begins. It merely proceeds at different rates with different temperatures; 302°-329° F. would be sufficient to decompose most foodstuffs at a fairly rapid rate, but some decomposition occurs at lower temperatures than this.

Consequently, if an organic colloid system is subjected to increasing temperature there will be a complete release of the free moisture, a fairly gradual release of physically bound moisture and simultaneously a gradual but increasing loss by decomposition. At the same time there may be a loss of other volatile substances. One cannot fix definite conditions under which all moisture is evolved without decomposition occurring, and thus no figure strictly representing moisture can be reported. Moisture content must therefore be regarded as a relative expression and must be qualified by a definition of the testing conditions.

These difficulties, however, are not as serious as might first appear. The objects of determining moisture are primarily for policing purposes, either of a material or of a process. Moisture content is not really significant in itself but only for comparison with other consignments of similar nature. The main purposes of the moisture test are:—

1. *To obtain "real value.*—Generally speaking, the value of a commodity is inversely related to its moisture content.

2. *To ascertain keeping quality.*—Most materials, particularly foodstuffs, have a critical moisture content beyond which their storage life markedly decreases. This renders them liable to more rapid deterioration, the development of taints and attack by bacteria and mould.

3. *Process control.* — Manufacturers naturally wish to produce a consistent material sufficiently low in moisture to undergo safe storage yet whose moisture content is not at an unduly low and uneconomic level. For instance, if the raw material were received at 20 per cent moisture, one would not wish to sell the product at 5 per cent.

4. *To decide the nature and degree of processing.*—In the flour-milling industry, for example, wheat going to the mill may contain up to 25 or 30 per cent moisture and this has to be dried down to approximately 15 per cent. The treatment given to this wheat will vary according to its original moisture content, not only as regards the total amount to be removed but also as regards the temperatures and times of drying. These must be modified for different moisture contents in order to avoid damage to the grain and consequently to the baking quality of the flour.

The Economic Factors

5. *To decide whether a material is worth processing at all.*—In dehydration processes, the economy of drying is highly dependent on the original moisture content of the raw material and the difference

between 85 and 90 per cent moisture here may make all the difference between profit and loss. At 85 per cent moisture one has to evaporate roughly 103 cwt. of water to obtain 1 ton of dried material (at 10 per cent moisture content), whereas at 90 per cent moisture 164 cwt. of moisture must be removed for a similar weight of product.

6. *To meet the requirements of legal statute or recognised trade practice.*—In the Wheat Act, for instance, it is necessary to declare the ash content of wheat offals on a 12½ per cent moisture basis, and this obviously requires a determination of moisture on the material leaving the mill.

Thus it is obvious that the true moisture content is not of any real significance. An arbitrary but established and reproducible method of testing is satisfactory if it is recognised as applying to the material in question, thereby making all results thoroughly comparative.

Not Usually Difficult

Sampling of reasonably dry materials is not normally difficult, except possibly in cases where further grinding is necessary, as during this process any heat developed may lead to some loss of moisture. In cases of this kind some small moisture loss is almost inevitable, except where such accuracy is required as to make stringent precautions necessary, but with normal care the samples can be satisfactorily and safely processed.

Greater difficulties arise where moisture contents are high particularly when they exceed 20 per cent. With materials like wet grass, fruit and vegetables preliminary drying is essential in order to obtain an even sample, as it is practically impossible to draw a representative 5 g. or 10 g. from a sample having the heterogenous nature of silage or green crops, for instance.

With any wet material the recommended procedure is a " double stage " moisture determination in which the first stage is intended to dry a bulk of the sample to approximate equilibrium with atmosphere. At this stage the material can safely be sampled down and ground to obtain a laboratory sample of uniform composition.

A suitable weight of sample should be immediately weighed and if necessary shredded to a convenient size. This sample should be dried by any appropriate method, preferably by freezing and vacuum processes, or by slow or rapid air-oven drying, according to the nature of the material. Care must be taken to ensure that the other constituents of the material are not adversely affected by the treatment.

Thus, when drying wet grass it is advisable to use the quick freezing and vacuum process in order to conserve carotene; failing this, if hot air is used, drying should be conducted as rapidly as possible because high-temperature/short-time drying leads to less destruction of carotene than longer time at a lower temperature. Conversely, when drying wheat that is ultimately to be used for milling, low-temperature drying is advisable in order that the gluten (protein) shall not be affected in its physical quality.

When drying has proceeded sufficiently the bulk sample is allowed to stand exposed to air while cooling. Any gain or loss during the cooling stage makes for closed equilibrium. When cool, the sample is weighed and can then be safely subsampled and ground, with due observance of all the precautions necessary for a normally dry material. A moisture test on this semi-dried sample allows the total moisture content to be determined according to the formula:—

$$\text{Percentage of moisture} = a + b - \frac{a \times b}{100}$$

where a and b represent the percentage moisture obtained in the two stages of the process.

Methods of estimating moisture vary considerably. The commonest method is heating in an oven, but there are methods of distillation, titration methods and others involving chemical processes, for example, evolution of acetylene from carbide. A few depend on the physical properties of water, such as depression of the freezing-point, or heat evolved when various chemicals are added. The most recent developments in this direction have produced types of electrical recorders which take advantage of the greater conductance of water compared with the medium in which it is contained. The chemist thus has a wide range of methods from which to choose that best suited to his particular conditions.

Variety of Techniques

There are many types of drying ovens and a wide variety of techniques for their use. The principal refinements lie in the use of vacuum apparatus or incorporating an atmosphere of inert gas.

The temperature, time of drying and the construction of the oven all have an important effect upon the final results. Temperature is the main factor controlling the amount of bound moisture that is evaporated, and strict accuracy of temperature control becomes of paramount importance particularly with low-temperature ovens. As little as 1° F. variation in temperature

can markedly affect the result with ovens working at approximately 212° F. This type of oven is also liable to considerable variations in temperature in different parts of the drying chamber unless the apparatus includes some form of ventilating fan. Inadequate ventilation may lead to differences in relative humidity from one batch to another.

The use of vacuum ovens will largely overcome these difficulties but tends to retard drying because of reduced convection and conduction of heat in the evacuated atmosphere. It may also increase the loss of other volatile matter.

Air ovens working at higher temperatures are not as susceptible to temperature variations as those working at about 212° F., but there will be increased loss of volatile substances and there may well be partial decomposition such as occurs in ovens working at 302° F. or above.

Where the material contains drying oils there may be a substantial increase of weight by oxidation; such materials as linseed and its products cannot be dried satisfactorily in an oven except in an inert gas atmosphere or by the use of vacuum.

As a rough guide, the following table shows, the differences between several accepted oven methods of determining moisture (as applied to wheat products). It indicates an overall range of more than 1 per cent moisture over a temperature scale of 103° F.

Temperature (°F.)	Time	Moisture differences (per cent)
208.4	5 hr	−0.7
212	5 hr	—
230	4 hr	0.2
239	4 hr	+0.4
248	2 hr	+0.4
311	15 min	+0.5

Nevertheless, the air oven provides the most popular and useful method for routine estimations except where very speedy results are required. This is partly due to the fact that it is easily adapted for rapid routine tests and does not make any great demand upon skilled chemists. One operator can easily perform over 100 separate moisture determinations when provided only with an oven of suitable size, an accurate air-damped balance and a desiccator. The method is ideally suited for factory control work in the hands of a semi-skilled operator. There is very little that can go wrong and cost of upkeep is low.

Common Oven Methods

Some of the most common oven methods include:—

1. The Water Oven at Approximately 210° F.

This is the least satisfactory oven drying method, as in practice the temperature inside the oven may be as low as 208° F. or as high as 211° F. Conditions vary according to altitude, as the boiling-point of water is affected by the barometric pressure. Furthermore, a low temperature implies a long drying time, which should never be less than 5 hr. and may be as much as 12 hr., particularly with materials that are not in a fine state of granularity. In view also of the small size of most water ovens the throughput is necessarily less than that of ovens working at higher temperatures.

2. The Air Oven at 212° F.

Usually this is electrically operated, and a properly thermostatically controlled and ventilated oven should maintain a uniform temperature. Here again, however, the disadvantage is the lengthy period of drying, which still must be in the region of 5 hr. This method of heating for 5 hr. at 212° F. is in fact the official method prescribed by the Wheat Act and other legal statutes, but in practice many analysts use less tedious processes and apply a correction factor to obtain the standard figure.

A Satisfactory Method

3. The Air Oven at 221° F.

This is one of the most satisfactory methods for routine control, in spite of the fact that it does not remove all the physically bound moisture. The temperature is sufficiently high to cause rapid drying and yet is not so high as to lead to the loss of much volatile matter, or to any appreciable decomposition. For most substances, 3 hours' drying is quite sufficient, and in fact there is very little difference between the results of tests extending over 2 and 3 hr. A large electric oven will hold as many as 50 samples, and one operator can easily manage the preparation, drying and weighing of three batches, totalling 150 samples, per day. For this purpose, of course, the sample containers should preferably be all of substantially the same weight and counterpoised on the balance, so that weighing can be made extremely rapid.

4. The Air Oven at 230° or 230° F.

This also is a popular and satisfactory routine apparatus for moisture determination. The samples may be dried for 2, 3 or 4 hr., and results are normally about 0.2 to 0.5 per cent higher than those given by the standard method of 5 hr. at 212° F. Even at 239° F. very little decomposition occurs with most materials, and under the conditions of the test most of the physically bound moisture should be released.

5. The Air Oven at 248° F.

Heating may be for either 1 or 2 hr.; 1 hours' heating gives a result approximately equal to the standard method, and with 2 hr. the figures are about 0.5 per cent higher than the standard. This technique seems to have little advantage over 230° or 239° F., as the higher temperature, while giving little economy in time, is approaching the range where decomposition commences. This method and all those previously given are essentially batch methods, and there is no real point in obtaining a drying time which is less than that taken by the operator to prepare the next range of sample and weigh off the previous batch.

6. The Brabender Oven at 266° F.

This German machine incorporates a novel device whereby the dishes are placed on one arm of a balance and can thus be weighed while still hot in the oven. While this arrangement has certain advantages in decreasing the number of manipulative operations, the method seems to lack real accuracy owing to convection currents within the machine and also the limited accuracy of the spring balance mechanism. The method operates over a drying period of 1 hr.

7. The Carter-Simon Oven at 301° F.

This process differs from the foregoing in that it is a continuous process operated for a short drying period. The oven is an electrically heated tunnel with hinged doors at either end. It is so constructed that it holds three samples; a sample is pushed through the inlet side every 5 min., displacing a dried sample at the outlet. Each container has exactly 15 min. in the oven, and the operator has 5 min. in which to weigh off each dried cooled sample and weigh on the next sample.

Although the throughput is not as high as in some of the batch methods previously described, it is a very convenient method where a reasonable but not very large number of samples has to be tested. In spite of the short time of drying the high temperature leads to results about 0.5 per cent higher than with the standard method, mainly owing to the removal of most of the bound water, but also partly because of some decomposition.

No Specific Time

8. The Chopin Laboratory Tester at 392° F.

The novelty of this apparatus is that drying is not for any specific length of time. The sample dish is placed within an electrically heated element in such a manner that the issuing water vapour passes through a tube of calcium carbide, giving forth a stream of acetylene, which is ignited; the sample is removed as soon as the flame decreases to a specified height. Owing to the high temperature used, considerable decomposition takes place and results are 0.5 to 1 per cent higher than by the standard method.

The main disadvantage of this method is that the construction of the apparatus allows only one sample to be tested at a time. However, each test only takes about 6 min. and there is no necessity to grind the sample to a fine state of division. Such materials as whole wheat and barley can be satisfactorily tested by this method. This is most useful where rapid results are required on a few samples, and particularly where these would require grinding before testing by conventional oven methods, as, for instance, with wet wheat or other grains.

Vacuum methods of drying normally consist of an adaptation of the ordinary air oven, and they work at approximately 212° F. Under these conditions there is a rapid initial loss of moisture, but vacuum treatment does not give the extremely quick drying that might be expected. Exclusion of air interferes with heat transfer because convection currents are absent and many organic materials are of low conductivity.

Pressure Remains Same

The vapour pressure of the water in the sample remains, of course, the same as it would be under normal atmospheric pressure. Even though the chamber is evacuated it does not follow that water vapour in contact with the sample will be removed very quickly, especially when one gets down to low moisture contents after the initial stage of drying. This particularly applies since the recommended procedure for vacuum oven methods is to leave the lid of the container loosely on the dish, so as to prevent dispersal of fine particles of the test material.

In theory, the right principle would seem to be alternate evacuation and release of dry air into the apparatus, so that any remaining moisture vapour would be rapidly swept out with each successive charge of air. Failing this, the material should first be heated at normal pressure, so that the application of vacuum will draw away the water vapour along with the air.

Vacuum ovens have definite advantages with substances that are liable to oxidation by air as, for instance, linseed prosducts. On the other hand, they have definite disadvantages when the test material contains an appreciable proportion of volatile matter, *e.g.*, many oils, some

sugars and esters. In general, vacuum methods utilising high temperature will give higher results than conventional oven methods working at normal pressure, the difference being as much as 1 to 2 per cent in many cases.

On the other hand, the use of low-temperature vacuum methods has much to recommend it when great accuracy is required at the expense of speed. The method of De Bruyn, using a high vacuum at 100° F., has been found to give accurate moisture figures unaffected by any loss other than moisture.

For this purpose it is important to obtain as large a drying surface as possible, and in one ingenious modification the material is placed in an inclined and rapidly rotating flask under high vacuum, so that the sample is in effect spread in a thin layer over the whole interior surface of the flask, giving much enhanced evaporative surface.

Recent Developments

More recent developments utilise extremely low temperatures and high-vacuum treatment, a procedure eminently suitable for very wet matter and one which renders negligible the possibility of decomposition. The method seems very well suited to a large number of biochemical assays in which it is desired to dry the test substance without impairing its content of vitamins, for instance. In most laboratories these low-temperature methods are ruled out because of the lack of facilities for very high vacuum and for the necessary low-temperature control.

There are a number of modifications of the method for the direct distillation of water, particularly from materials having a higher moisture content. They are all similar in that the sample is treated with an immiscible liquid such as oil or hydrocarbons. In some methods the liquid is volatile, in others it is not. The principle is that with increasing temperature the water is distilled from the test sample, is condensed and collects into a graduated side tube where its volume is measured.

The original method of Dean and Stark uses a volatile liquid which distills over along with the water, but, being lighter, forms a supernatant layer which is arranged to flow back into the sample flask. Xylene, benzene and toluene have commonly been used as the solvents. The methods are fairly accurate and avoid many of the complications experienced with very wet materials; but normally they estimate only free moisture, and not that physically bound in the material. Furthermore, since most of these solvents are inflammable, there is a certain element of danger unless the operator has some degree of manipulative skill.

The Brown-Duval and its modifications use higher boiling-point liquids, such as mineral oil, in place of the more volatile hydrocarbons. The principle is the same as with other distillation methods, except that the water distils fairly pure. Even though the temperature utilised may go up to 356° or 392° F., it would still appear that only part of the bound moisture is removed, and the recorded moisture figures are normally lower than with the conventional oven methods.

Theoretically, a large number of methods of estimating moisture by chemical means would appear possible, in view of the large number of reactions in which water plays a specific part. In practice, however, few of these have been proposed and only one or two have achieved prominence, mainly owing to the difficulty of ensuring (i) that complete reaction takes place, and (ii) that it includes the physically combined moisture present in test materials.

The most popular method is the direct titration technique using the Karl Fischer reagent, in which water is extracted by the use of a dry miscible liquid such as methyl alcohol. To this is added excess of a mixture of iodine and sulphur dioxide in pyridine, the two reagents reacting with water to produce, in effect, hydriotic acid and sulphurous acid. The purpose of pyridine is to combine with these products and prevent any undesired reversible reaction.

Excess reagent is back-titrated with a solution of water in methyl alcohol until the colour changes from brown to yellow, indicating that all the iodine has been reduced.

Careful Standardisation

The method requires careful standardisation of the reaction solutions, granularity of the test substance, and the time of reaction. Under reproducible conditions, however, the method gives satisfactory results that duplicate well, but the figures are usually below those obtained by oven methods. It has the great advantage that in a properly organised laboratory a great many samples can be tested rapidly and that a minimum of apparatus is required. The procedure is no more complicated than any ordinary chemical titration.

Although the method would seem ideally suited for materials of very high moisture content it has the inherent disadvantage that only small amounts of water can be

titrated, the total amount being of the order of 0.1 to 0.2 g. Thus with a sample of even 20 per cent moisture content, not more than 1 g. of sample can be tested; this necessarily raises difficulties in obtaining an even and representative sample.

Another chemical method with fairly wide application takes advantage of the reaction between water and calcium carbide to form acetylene. There are several modifications of this, but the principle is that the carbide evolved is measured either volumetrically or by pressure. While the method gives reasonably satisfactory results for substances containing only free water—as, for instance, coal and many inorganic materials—it gives low and erratic results with many organic materials where bound water is present or when the material is not finely ground. In a series of tests on wheat and wheat flours, results obtained by this method have been found to be about 4 per cent too low. In the author's experience, results on grain ranging from 10 to 80 per cent moisture are so erratic as to be useless.

The methods previously described are essentially suitable for the analyst or the works chemist in the factory laboratory, but hardly adapted for use in the factory itself. They require at least a semi-skilled operator, one also who is more or less completely engaged on the task. Even the quickest of these methods is fairly time-consuming and results would not be obtained in less than 15 minutes, while very often far more time would be needed.

In many modern processes there is definite need for a rapid means of assessing moisture, even if accuracy is to some extent sacrificed to speed. It is for this reason that the rapid electrical methods have come so much to the fore recently. They take advantage of the fact that the test material by itself is a relatively poor conductor of electricity and that increasing the moisture content raises the conductivity or, alternatively, the electrical permittivity of the material.

Balanced Wheatstone Bridge

The simplest form of the apparatus is a balanced Wheatstone bridge consisting of four condensers. The test material is applied between the plates of one condenser and the amount that the circuit is thereby thrown out of balance is directly related to moisture content. The reading can therefore be taken instantaneously and each test requires no more than 2 or 3 minutes' operative time. Furthermore, the apparatus can easily be installed in any part of the factory and can be operated with very little training by any reasonably intelligent non-technical operator. All these instruments require preliminary calibration over a range of moisture contents for each type of product tested, usually against a standard oven method.

The accuracy of the method is, however, highly dependent on a number of factors which for some materials, may be sources of sufficient error to render the technique useless. In most instruments of this type where the resistance or permittivity is measured through a condenser, the packing effect represents a major and often uncontrolled variable. A free-running material of granular but fairly small particle size will pack fairly uniformly, and from this point of view will give consistent results. Where the material is fine but not free-running, as, for instance, with flour and many other carbohydrate products, or when it is large and irregular, as with whole cereals, particularly oats and barley, then even different replicates of the same sample will not pack similarly and will give variable readings. Two different samples of the same cereal (*e.g.*, two parcels of oats) will produce even wider variation on this account.

Even Flow Essential

Packing is influenced to a considerable extent by the method of filling, and the accuracy of the various instruments is significantly correlated with the efficiency of the device for ensuring an even flow of material into the condenser.

The second major failing of most of the electrical moisture meters lies in the possible uneven distribution of moisture in the material under test. Surface moisture will naturally form a more or less continuous bridge or bypass between the plates of the condenser and will give a different result from a similar sample of the same moisture content but in which the moisture is uniformly dispersed throughout. On this account, most electrical instruments are only of limited use where moisture is unevenly distributed

There are, however, some machines in which this error is reduced to the minimum.

Among future developments there will probably be further refinements of electrical methods of moisture measurement, and it would not be over-optimistic to forecast that within the next 10 or 20 years there should be accurate and instantaneous methods available for the determination of moisture in every kind of material, irrespective of its physical nature.

CHEMISTRY IN FOOD RESEARCH

Use of Electrophoresis Techniques

IN the realm of foods comparatively little is known about the chemistry of the materials responsible for texture and consistency, nor about the flavour substances and natural colouring matters. It is felt that any increased knowledge of these components will be of value in elucidating problems connected with the palatability of foods, and in the development of new processes designed to achieve improved storage and handling of foodstuffs.

Much more information is still required, for example, concerning the connective tissue components of meat and other animal foodstuffs. Among the substances so far investigated have been cartilage, collagen, elastin, and the mucin present in the white of eggs.

Food research under Government auspices in this country is in the charge of the Food Investigation Organisation. Of the three main laboratories under this organisation, the Low Temperature Station for research in biochemistry and biophysics, at Cambridge, deals especially with work of a long-term nature. In this laboratory, chromatographic methods are being applied to many fundamental problems of food research.

The Procedure Adopted

The procedure adopted by the investigators involves first the isolation of substances of high molecular weight and then the development of suitable techniques for their successive degradation, followed by a study of the products obtained.

The substances with which the investigators are mainly concerned are the connective tissues, together with the mucoproteins and muco-polysaccharides that occur in association with these substances. Thus a complex of techniques for fractionation and isolation are required. For the large molecules established physical methods such as electrophoresis or fractionation with salts or alcoholic solvents are used.

Isolation of the smaller degradation products is attained by separating the substances into main groups by the use of ion exchange resins.

Three main groups are obtained from the first separation; namely, organic bases and amino acids, neutral substances such as sugars and polyhydroxy alcohols, and organic acids. Each of these main groups may then be analysed qualitatively, and in some cases quantitatively, by means of filter-paper chromatography.

Although paper chromatography is not usually suitable for obtaining accurate quantitative results, it has the special advantage (as shown by Consden, Gordon and Martin), that useful separations may be obtained with as many as nineteen or twenty amino acids on the same chromatogram.

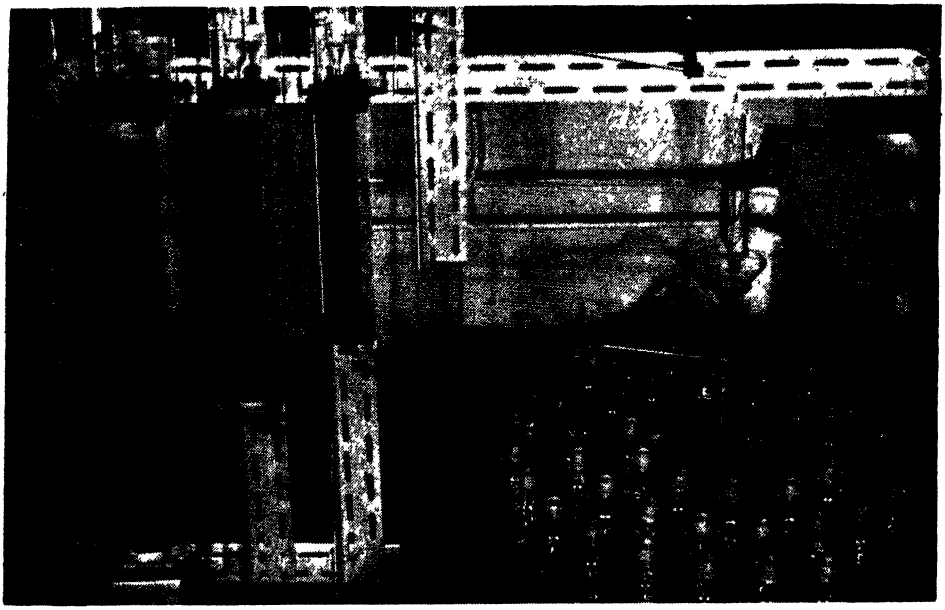
Method of Identification

Partridge at the Low Temperature Research Station was the first to work out a method for the identification of reducing sugars in mixtures by use of the filter-paper chromatogram. The use as a spraying reagent of a solution of silver nitrate of ammonia, or a solution containing aniline and phthalic acid, was found to be effective as a general method for revealing the position of the sugars on the chromatogram. The behaviour on the filter-paper chromatogram of 22 sugars and sugar derivatives was investigated, using general solvents.

For separation and isolation of the components of biological mixtures on a larger scale, column methods of chromatography are required. One such process developed at the Low Temperature Station uses various synthetic and commercial ion-exchange resins.

The ion-exchange column shown in the photograph was designed and constructed at the station and is capable of handling from 250 to 300 grams of hydrolysed protein. The solution containing the mixture of amino acids obtained from the protein under investigation is passed through columns which have been successively reduced in diameter in order to improve the boundaries. The column is then developed with a solution of a strong base and the effluent runs into an automatic fraction collector designed to collect 60 fractions.

The bottles are arranged in spirals and the correct quantity is automatically delivered to each one in turn by means of a syphon suspended from a balance arm. The contents of the bottles are analysed qualitatively by means of filter-paper chromatograms and the components of the various bands are collected together.



Where a band contains more than one amino acid, a further column procedure is required to complete the isolation.

By this method a complicated mixture of organic bases and amino acids may be separated into seven or eight fractions by a single passage through a column containing a cation exchanger. Each of these groups contains no more than two or three amino acids, so that the individual components of each group may readily be separated by the use of further columns packed with other ion exchange resins. By this procedure it has recently been found possible to isolate in a pure condition 15 amino acids from the same sample of hydrolysed protein.

A procedure adopted for the isolation of amino acids from the hydrolysis product of commercial egg albumin was as follows: Since tyrosine and phenylalanine interfere with chromatographic separation on ion-exchange resins, these were first removed, together with soluble humin, by adsorption on charcoal.

Tyrosine and phenylalanine were recovered by eluting the charcoal with aqueous phenol-acetic acid. The charcoal-treated product was then fractionated on a column of Zeo-Karb 215 by displacement with ammonia solution.

The flowing chromatogram so obtained was analysed by filter-paper chromatography. The results showed that the mixture had been resolved into seven bands: (1) aspartic acid; (2) glutamic acid, serine and thylonine; (3) glycine and alanine; (4) valine and proline; (5) leucine, isoleucine, methionine and cystine; (6) histidine and glucosamine; (7) lysine.

The amino acids or amino acid mixtures contained in each band were recovered as salt-free crystalline solids by evaporating appropriate fractions from the effluent solution. The crystalline products obtained represented a yield of 45.6 per cent calculated on the weight of dry proteins.

The isolation of individual amino acids was then achieved by further fractionation of the simplified mixtures contained in the bands. For instance, glutamic acid was isolated from Band 2 by adsorption on an anion exchange resin; a mixture of the isomeric leucines was isolated from Band 5 by selective oxidation with bromine water, followed by further fractionation on ion-exchange columns; the separation of proline and valine from Band 4 was carried out by displacing the mixture from a column of Zeo-Karb 215 at 60° C.

The ion-exchange method developed by the Low Temperature Research Station may be used for biological extracts of many kinds. It represents an attempt to evolve a systematic procedure for handling the complex mixtures of bases, sugars and organic acids so frequently encountered in biochemical research.

The fundamental nature of the work which the station is undertaking is well exemplified by an investigation of the intercellular substance of bovine cartilage,

which is composed almost exclusively of two major components, collagen and chondroitin sulphate.

It was considered desirable to make a preliminary study of the chemical structure of the intact tissue, a possible line of approach being the application of a process of successive mild degredations of one or other of the components of the tissue, followed by an examination of the breakdown products that resulted.

Since published data on the thermal contraction of collagen fibres were insufficient to afford a direct comparison with the methods devised for the extraction of cartilage, a number of experiments were carried out during the course of this work to determine the effect on rat-tail tendon of the temperature and concentration conditions used in the extraction experiments.

A soluble mucoid may be extracted from dried cartilage powder after a short heat treatment with water. It was considered probable that the chondroitin sulphate liberated under the rather mild conditions that give rise to thermal shrinking of collagen fibres, remains in a condition closely approaching its state in the tissue itself. A study of the physical and chemical properties of the extracted mucoid has therefore been of value.

Prepared under the lowest effective temperature conditions, the mucoid behaves in the electrophoresis apparatus of Tiselius as an equilibrium mixture of chondroitin sulphate, protein and a complex formed between the two. The association of chondroitin sulphate with protein in the mucoid occurs over the range pH 5-9, within which both the protein and the acid polysaccharide are negatively charged.

A Different Type

The complex formation is of a different type from the salt formation known to occur below pH 4.85. On further heating, the mucoid loses its capacity to form complexes at pH 5-9 and suffers a rapid reduction in viscosity. In the light of the knowledge gained from this investigation, it is suggested that chondroitin sulphate has an important rôle in the organisation of collagen in developing connective tissues.

Dr. Isherwood and his co-workers at the Low Temperature Research Station are engaged on what might be termed parallel investigations into the cell walls of plants. These workers are studying the polysaccharides in the cell wall during physiological changes such as ripening. Here again, the problem is being examined on a fundamental basis and effective use is being made of the filter-paper chromatogram and electrophoresis techniques previously described. Three different methods of approach have been adopted.

The first line of attack is to take the entire cell wall—that is the carbohydrate portion—and hydrolyse it to its constituent sugars. The amounts of the various sugars present are quantitatively estimated by the filter-paper chromatogram technique.

Changes Followed

By using this procedure the investigators are able to follow the changes which occur in the cell wall during ripening and similar physiological changes in terms of the changes in the constituent sugars that make up the polysaccharides. These observations do not, of course, yield any information regarding the composition of the individual polysaccharides or how the changes occur.

The second approach to the problem consists in dividing the cell wall into a number of arbitrary fractions such as pectine, hemi-cellulose, alpha cellulose, and so on, by extraction with water and increasing strength of alkali. By separation from the various arbitrary or connected fractions as good a yield as possible is obtained of pure homogeneous polysaccharides. These are then related to the sugars obtained by hydrolysis of the fraction. By working on these lines it has been possible to obtain from the parent cell wall a pure polyalacturonic acid, pure araban, a pure xylan, and a pure cellulose.

A third method of investigation is to separate the arbitrary fractions by dissolving them in a solvent such as strong sodium hydroxide, which disperses the polysaccharide molecules, and then subject these molecules to an electric field in an electrophoretic apparatus. It is possible by this means to show that the arbitrary fractions obtained from the cell wall contain a number of polysaccharides. Furthermore, it has been possible to relate the analysis of the arbitrary fractions with the electrophoretic pattern of the fraction itself.

As a result of the work already accomplished in this field, the Low Temperature Research Station have found that the cell wall of the pear fruit consists essentially of a number of polysaccharides, each of which has been built up from one sugar only. The various arbitrary fractions such as pectine, are mixtures of some or all of these polysaccharides.

Foreign Capital for German Oil Refineries

Shortages Interfere with Paint Manufacture

FOREIGN interest in the utilisation of German coal and oil distillation plant has been reflected by news of U.S. and British participation in the operation of refining capacity in Western Germany. A French group, Omnium Francais des Pétroles, has now entered this field by arrangements concluded through its German subsidiary, Omnipetrol G.m.b.H. of Karlsruhe, with Ruhrchemie A.G. of Oberhausen-Holten.

Under this agreement Omnium will supply Middle East crude oil to Ruhrchemie. The crude will be topped in existing distillation plant, and the residue will be subjected to thermal cracking. The maximum throughput will be 200,000 tons a year, and the output of motor spirit 100,000 tons; in addition, there will be substantial tonnages of diesel oil, fuel oil, asphalt and refinery gases.

Allied Co-operation

High Commission consent has already been obtained for the scheme which will result in a considerable saving of capital. To erect equivalent refining capacity from scratch would, in present circumstances, cost about twice as much as the work to be performed at Oberhausen - Holten. Ruhrchemie A.G. is to repair the damaged installations and erect the new plant required in co-operation with German, French, and U.S. firms. Refining operations will be conducted on a fee basis, Omnium retaining possession of the crude oil and the finished products.

E.C.A. financial assistance has been secured for the refinery project at Lingen in the Emsland district where by 1952 some 600,000 tons of indigenous crude oil are to be treated. In the next two years it is hoped to raise petroleum production in Western Germany to 2,000,000 tons a year. The Lingen refinery would thus be able to process approximately one-third of the entire German crude oil output, a substantial part of which originates in the Emsland district.

The shortage of tetra-ethyl lead which caused some anxiety has been overcome for the time being by the arrival of a substantial consignment under E.R.P. auspices and grant of permission by the U.S. authorities for further shipments to Western Germany. Meanwhile one of the leading colliery undertakings in the Ruhr, Hibernia A.G., has announced that it will install plant for making tetraethyl lead in one of its chemical works.

Difficulties in the supply of white lead, zinc oxide, solvents and collodion are likely to force West German paint and lacquer manufacturers to curtail operations even though the linseed oil supply is assured until the middle of 1951. Some paint makers have already reduced their output. Wholesalers have been warned to expect higher prices in the near future. Some 500 firms with about 17,000 employees are still engaged in the manufacture of lacquers, despite the elimination of many post-war newcomers who took advantage of the urgent demand immediately after the war and the currency reform, but have had to leave the field since. A further contraction and concentration is expected as a result of the present raw material difficulties.

Among new products of chemical interest now made in Germany is metallic tantalum which is being produced in the form of sheets, foil and wire by W. C. Heraeus G.m.b.H. at Hanau which is reported to employ a novel form of surface hardening. This firm has also put on the market a new type of heating appliance for laboratory use. The heat-radiating wires are enclosed by a glass fibre mesh which is placed over the glass tubes, etc., to be heated, and surrounded by several layers of glass wool which prevent loss of heat to the outside. Temperatures of up to 400° C. are reached.

Swiss Agreement

New trade agreements have been concluded with Greece, Norway, and Iran. In all three agreements chemicals figure prominently among the principal exports from Western Germany. The German-Swiss trade agreement put into force with retrospective effect from September 1 provides for 60 per cent trade liberalisation on both sides. In addition, group quotas have been fixed which, *inter alia*, permit German imports of DM.13,440,000 worth of Swiss dyestuffs, while Switzerland has limited chemical imports from Germany in so far as not covered by the liberalisation clause to sfr.8 million.

The number of persons employed in the East German chemical industry is estimated at 120,000-150,000, of whom no fewer than 25,000 are working in the Soviet-controlled Leuna works.

CHEMOTHERAPY OF CANCER

A LECTURE on "The Chemotherapy of Cancer" was delivered to the Fine Chemicals Group of the Society of Chemical Industry at the Royal Institution on November 13 by Professor Alexander Haddow, director of the Chester Beatty Institute, the Royal Cancer Hospital.

The great majority of cases of cancer at present, said Professor Haddow, were treated either by surgery or by radiotherapy. Each of these methods had its limitations, and in any case it would clearly be advantageous, particularly as widespread dissemination was an outstanding feature of the disease, if a less local and more general control of malignancy, such as could presumably be brought about by chemical means, were possible.

This had been well recognised from the earliest beginnings of the study of cancer. At different times in the past there had been applied such agents as belladonna, aconite, mercury, antimony, and arsenic. Many of these chemical applications had a merely caustic action, as, for instance, in the local use of concentrated acids and alkalis and various metals and metalloids. Arsenic had an action which, though not specific, was less indifferent than the others, and the effects of arsenic in the treatment of cancer had been studied more continuously than those of any other agent.

There had been during the last few years a new burst of activity, arising very largely from a similar increase of interest in more fundamental work in the cancer field as a whole. In fact, more had been accomplished during the last 10 years than in any other period, though the greater part still remained to be achieved.

Unique Development

The cancer cell was a unique development of a specific cell type in an adaptive response to unfavourable conditions, and this was only one of the inherent difficulties which confronted any attempt at chemotherapy. Chemotherapy was expected to undo what could almost be regarded as a natural process.

It was perhaps not surprising that such developments in this field as had taken place in recent years had been accomplished without much thought of practical application, mostly as by-products of more important work. This was certainly so in the endocrine control of cancer of the prostate, which was of importance as being the first indication that the autonomy of the cancer cell was not necessarily complete and that it was in fact open to attack by chemotherapy.

In the special case of cancer of the prostate pronounced therapeutic effects were produced by the administration of a natural or synthetic oestrogen, stilboestrol being the synthetic substance most frequently used. In favourable circumstances improvement consisted of a decrease in size of the primary tumour, possibly regression of metastases in bone, improvement in the blood picture, gain in weight, and relief of pain.

Therapy Prolongs Life

This therapy had now been employed for a sufficiently long time to make it clear that, while cancer of the prostate certainly could not be cured by this means, there was equally no doubt that the foci of the disease became quiescent and life was prolonged. Again, in a small proportion of cancers of the breast treated by oestrogen there was a most dramatic temporary response. A further example of chemotherapy acting through alteration of the hormonal environment of the tumour was the administration of the male sex hormone in cancer of the female breast.

Among other conditions in which the action of urethane had been tested and unusually gratifying responses had been forthcoming was myelomatosis. The action of urethane was characterised by an extremely high degree of chemical specificity, and investigators had been very much concerned to decipher the biochemical mechanism of its action. One of the various alternatives which might be considered was that the substance might renovate some deficiency in the chemical differentiation of the cell.

With regard to aminopterin, clinical effects were not sufficiently lasting, yet the observation of its action was of fundamental interest and one which would certainly play some part in extending the knowledge of the nutritional basis of cell division.

Professor Haddow came next to a different group of substances—the so-called nitrogen mustards, the biological effects of which on tissues in an active state of proliferation were recognised. During the war they had been tried in Hodgkin's disease and various malignant conditions, in which they had undoubtedly a limited therapeutic action, and it

seemed not unreasonable to expect to improve the therapeutic effect by chemical modifications. During the last four years some 250 variants had been tested at the Royal Cancer Hospital, and a number of compounds had been prepared, some of which had perceptible advantages in reduced toxicity. He mentioned in particular the chloroethyl derivative of β-naphthylamine. Recent reports indicated that substances of this type might represent a slight advance, especially in the treatment of such conditions as chronic lymphatic leukaemia. Part of the advantage related, not to any marked increase in inherent activity, but rather to ease of administration and relative absence of serious toxic effects. These compounds, like X-rays, could be responsible for nuclear damage, production of mutations, and other effects hitherto associated with ionising radiations. Quantitative comparison of various biological effects induced chemically and by radiation, both *in vivo* and *in vitro,* showed a correspondence greater than would seem likely on the grounds of chance alone. The comparison was reinforced by the more recent finding that mustards of this type, again like *x* and gamma radiation, could also under suitable experimental conditions induce both cancer and mutation. This must be regarded as an important contraindication to the use of them in younger subjects still in the reproductive phase.

Finally the lecturer touched on the recent developments concerning the effects of ACTH and cortisone in lymphosarcoma, chronic lymphatic leukaemia, acute leukaemia, and certain neoplastic disorders. Again it would seem that any therapeutic action here was subject to obvious limitations and accompanied by certain disadvantages and side-effects; but these observations marked a stage towards an eventual understanding of the different means, direct or indirect, by which the growth of the cancer cell could be affected.

Infra-Red Label Drier

Idris, Ltd., recently installed a Metrovick infra-red unit for drying the bottle sealing Viskrings and also the bottle labels in one operation. The bottles pass through the unit at a rate of 300 dozen per hour, each bottle taking 20 seconds. If for any reason the conveyor speed has to be reduced, the infra-red unit is fitted with a temperature control switch to reduce the heat output of the infra-red element projectors. The unit is 8 ft. long by 1 ft. 6 in. wide and operates on 415 volts, 3 phase A.C. with a total loading of 17 kW.

SIMPLIFIED VISCOSITY TEST

AN improved method for determining the quality of cellulose has recently been devised by H. F. Launer and William K. Wilson of the U.S. National Bureau of Standards. The new method is a simplification of the cupremmonium viscosity determination, which is widely used as an aid in determining the effect of light, heat, and chemical reagents on the cellulose in paper and textiles. Advantages of the Bureau's procedure are said to be ease of preparation of the cuprammonium reagent and a reduction in sources of error during the reaction.

A Most Important Test

The cuprammonium test is one of the most important in cellulose chemistry. It involves the measurement of the time required for a definite quantity of a solution of cellulose in cuprammonium hydroxide to flow from a calibrated viscometer. This time of flow, usually measured at 20° C. or a solution containing 0.5 per cent cellulose, is related to the viscosity of the solution and therefore to the quality of the cellulose.

Cuprammonium is usually prepared by the air-oxidation of metallic copper in ammonium hydroxide. This is a laborious, time-consuming process and is further complicated by the formation of ammonium nitrate, which lessens the usefulness of the solution. As the reagent is unstable at room temperature, it must be stored at 0° C. Another disadvantage in the cuprammonium test as ordinarily carried out is the necessity of using special apparatus to exclude air during the solution of the cellulose since cellulose is particularly sensitive to oxidation.

The new procedure removes the difficulties in both stages of the process. The cuprammonium reagent is first prepared by dissolving solid cupric hydroxide in ammonium hydroxide in an ice bath. This easy method of preparation makes storage unnecessary. Cellulose is then dissolved in the reagent, with the addition of cuprous chloride and copper wire to prevent air oxidation. Rubber-stoppered Erlenmeyer flasks are convenient for this purpose and mechanical agitation facilitates the process. The time of flow of the resulting solution is measured in a viscometer enclosed in a glass jacket, through which water is pumped from a constant-temperature bath.

This procedure has been found to save both time and labour. The results compare favourably with those obtained by the older method.

INCREASING DEMAND FOR TECHNICIANS

Need to Maintain Scientific Training

THE inestimable value of the brains of our scientists and technicians in the export market and the necessity for chemists to remain true to their jobs without any material or political bias, were emphasised at the annual dinner of the British Association of Chemists held in London last Friday.

The Chemist's Rôle

After briefly and wittily welcoming "The Ladies and Our Guests," the president, Dr. Herbert Levinstein, turned to the more serious problems of the present difficult times and the importance of the chemist's rôle in helping to overcome them. The state of crisis would not readily pass over, and in the very near future there was likely to be much stricter control of both materials and manpower.

Sound professional people were getting scarcer and there were fewer academically trained chemists in proportion to those who were half-trained. The chemist must remain true to his profession and unprejudiced by any outside influences.

Replying for the guests, Mr. William J. Darby, chairman of Lewis Berger & Sons, Ltd., said that a good deal of any success that he had enjoyed had been linked up with the ability to use the technician and to secure his loyalty. When he joined Berger he stepped up the technical staff from 23 to 80 members—now there were some 150 throughout the group.

Nowadays he was less closely in contact with technicians and so felt able to take a more detached view. In a general way, scientists seemed to be outmoded at the moment in the public's eye—and he felt some of them deserved to be.

Industry also did not think so much of them as it did, continued Mr. Darby There seemed to be two main reasons for this.

First, now that there was more competition for his services, the technician appeared not to be giving the same unit of effort. Secondly, there was a general apprehension that scientists were tending to move rapidly to the Left in political thought, which was causing a certain amount of mistrust.

The chemist could not afford to indulge in this form of escapism or intellectual gymnastics, continued Mr. Darby.

The country, he concluded, was gradually returning to Elizabethan times when we sold our brains abroad and backed them up with capital to establish and maintain a predominant position in commerce throughout the world.

Today we were not able to provide the capital, and all we had left to export was our brains and technical effort as day after day countries were legislating to exclude our goods.

It was a serious thought and carried with it its own implications. These were that scientific training in this country must not only be maintained, but strengthened, and that scientists would have to be prepared to travel abroad if they wished to secure a fair share of comforts.

This country had a great heritage and despite all present problems we were expected to make it great again. There was only one way to do that—hard work. It was up to every individual never to throw up his hands and—most essential—always to retain a sense of humour.

Professor D. M. Newitt, president of the Institution of Chemical Engineers, proposed the toast of the "President and the BAC."

Among those present were:—

Dr. and Mrs. Herbert Levinstein; Professor and Mrs. D. M. Newitt; Mr. and Mrs. H. L. Howard; Mr. William J. Darby; Mr. and Mrs. T. McLachlan; Mr. O. W. Petzold; Mr Rhodes; Mr. and Mrs. Crocker and Miss Crocker; and Mr. Davies.

B.A.C. ANNUAL MEETING

AN active and successful year was recorded in the report of the council for 1949/50 at the annual general meeting of the British Association of Chemists held in London on December 2, with the retiring president, Dr. H. Levinstein, in the chair.

The association had continued to serve its members successfully during the past year, giving advice and assistance on many problems, in some cases with substantial financial benefit.

A conference of section secretaries was held in London in July, and had proved of great value in achieving closer co-ordination between the sections and head office. It was hoped to hold a similar conference annually in future.

Membership had been maintained, and

an appeal was made for increased membership.

In spite of heavier outgoings the Unemployment Benefit Fund had increased by about £680 during the year. Benefits paid amounted to £1536 compared with £633 in the previous year. Claims, however, had been reduced during the latter part of the period under review, and were now few in number. A recommendation that bonuses given during the two previous years should be continued during 1950/51, was adopted.

The association's appointments service continued to be well patronised by members and employers. Over 100 members received the circular weekly, 156 posts were advertised at the direct request of employers, and 3249 other vacancies were included.

Attention was drawn again to the contributory, transferable, pension scheme available to members of the association, details of which were circulated in February. The special facilities offered to the members by the General Accident, Fire and Life Assurance Corporation was also pointed out. Many members had saved more than the amount of their subscription to the B.A.C. by making use of the latter arrangement.

The report was adopted.

The Hinchley Medal, commemorating the work of the late Professor J. W. Hinchley, who was a founder-member of the BAC, and awarded for outstanding work on behalf of the association, was presented by the president to Dr. F. W. Kay, also a founder-member and the first hon. registrar.

The New Officers

Officers elected for the ensuing year were as follows:—President, Major R. P. Porter; vice-presidents: Dr. H. Levinstein, Mr. Norman Sheldon, Mr. G. T. Gurr and Mr. T. McLachlan; hon. treasurer, Mr. H. R. Neech; hon. secretary, Dr. F. W. Kay; hon. registrar, Mr. H. L. Howard; trustees: Mr. C. S. Garland, Mr. G. T. Gurr and Mr. C. A. Wylie; hon. editor, Mr. T. Crosbie Walsh; hon. auditors, Mr. Threadkell and Mrs. A. J. Baker.

Members elected to the council were Dr. A. T. Healey, Mr. J. Wilson, Mr. Greenwood and Mr. R. J. Wilkins.

The professional auditors were reappointed.

Proposed new rules, which had been circulated, and which effected simplification, were approved.

Satisfaction was expressed by members with the organisation at head office arranged a year ago, whereby Mr. H. Feldon Baker, F.C.A., was appointed secretary-accountant, and Mr. G. R. Langdale, A.C.A., as his deputy.

Thanks were accorded to Dr. Levinstein and his fellow officers and councillors for their work during the past year, and special mention was made of the work of Mr. H. L. Howard as acting general secretary.

MATERIALS DISTRIBUTION

PROPOSALS to try and overcome the shortage of raw materials were decided upon at a meeting of the council of OEEC in Paris last week-end. The principal commodities involved were:—coke and coking coal, scrap iron, iron ore, some finished steel products, manganese, copper, zinc, tin, aluminium, fibres for paper and textiles, sulphur, rubber and raw materials for synthetic rubber, timber and pulp, cement, and leather and skins.

The sources of supply of many of these raw materials are not within or under the control of member countries, and the issue was one of technical complexity.

The decision of the council therefore contained a number of different recommendations, each appropriate to a given set of raw materials.

A special effort is to be made by member countries, both at home and in their overseas territories, to increase production of coal, metal ores, and sulphur; to make fuller use of existing productive capacity for coke, aluminium and pulp made from available fibrous materials; and to increase the recovery of ferrous scrap, sulphur bearing materials, waste paper and rags.

Coal is a commodity of which the member countries have plentiful supplies. Among the council's suggestions are: an equitable distribution of coal among member countries, especially of metallurgical coke and coking fines for blast furnaces; and the need to take fairly into account the requirements of all types of consumers

The importance of non-ferrous metals, especially copper zinc and nickel for defence has been the main cause of building up of large reserve stocks in the U.S.A. It is, therefore, appreciated by member countries that supply of these metals will have to be given special consideration by the U.S.A. and Canada. The case of nations belonging to the Atlantic Pact would probably be considered collectively,

A special OEEC mission is to visit the U.S.A. to discuss raw material problems, particularly sulphur and cotton, of which America is by far the largest source of supply.

FUNDAMENTALS OF ATOMIC RADIATION

INITIATING cause of the biological effects of ionising radiation is believed to be the profound chemical changes caused by the ionisation of the constituent atoms and molecules of organisms. This is among the basic points which Dr. G. J. Neary made in his article in the current issue of "The Practitioner."

At a Press conference held to introduce this important issue, Sir Ernest Rock Carling, Adviser on Casualties to the Home Office, outlined its purpose. Accurate facts about atomic warfare were essential and the journal had therefcre decided to devote a whole issue to the medical aspects in their fullest sense. This not only included questions of medical treatments, genetic effects and organisational problems but also required those interested to understand what happens under the action of radiation. It was the basic physics and associated chemistry of these phenomena which Dr. Neary discussed.

Energies of only a few electron volts are involved when an atom or molecule absorbs or emits radiation. Ionisation involves energies about 10 times greater, corresponding to the complete freeing of an electron from the atom. The electron thus detached may then attach itself to some other atom or molecule. It is this set of disturbances of the atom and the reactive properties of ions which lead to the chemical and thus the biological effects.

The Basic Measure

The basic physical measure of dose for all ionising radiations is the amount of energy absorbed per unit mass, normally expressed in ergs per gram. The *Roentgen*, historically evolved for the measure of X-rays and gamma rays and based on the ionisation of air, corresponds to an energy absorption of about 93 ergs per gram. Energy absorption for other radiations—including neutrons, for which air ionisation is a quite unsuitable measure—are expressed in "roentgen equivalent physical" or "rep." The production of ions can be used in the detection and measurement of radiation for monitoring purposes. This may be done either directly due to air ionisation, or by the chemical effects involved. For this purpose the blackening of photographic film or the change of colour of crystals may be applied.

A small percentage of the energy of an explosion appears as fast neutron radiation of such intensity that exposure up to about a 1000 feet away would of itself prove fatal. The neutrons very rapidly lose energy, in traversing matter; their initial energy of a few million electron volts is rapidly reduced to the level of energy of ordinary thermal agitation. They may then be captured by a nucleus forming a radioactive isotope which will then disintegrate emitting beta and gamma rays. An undersea burst could result in the formation of radioactive sodium Na^{24}.

Gamma Rays Important

The most important ionising radiations from an atomic explosion are the gamma rays both from the explosion and from radioactivity of the fission fragments. These break down utimately to stable fission products, through a series of radioactive changes according to the exponential lay of decay for each successive unstable nucleus. The activity of radioactive material is measured in terms of the number of nuclei transforming per unit time. The unit is the *curie*, representing 3.7×10^{10} disintegration per second—approximately the activity of one gram of radium. In an atomic explosion roughly a million million curies are produced immediately and roughly one-tenth this quantity in subsequent radiations with a rapid decrease in the rate of change. For instance, activity falls to six thousand million in one hour, thirteen millions in one week and one hundred thousand after one year.

Intensity falls off with distance both because of the inverse square law and because of the attenuating effect of encounters with atoms. The attenuating power of a medium is dependent on its density and on its atomic composition—both physical and chemical. Heavy atoms are much better absorbers than light atoms.

Lastly, the question of ingestion and inhalation of active material is of great importance. Many chemical elements tend to get concentrated and localised in particular organs producing a higher intensity of chronic irradiation than if they were uniformly distributed. Standards now exist for safety levels of radioactivity in air and water which would help in assessing the hazard in a particular set of circumstances.

Non-Ferrous Metal Statistics

CONSUMPTION of non-ferrous metals in the United Kingdom in October was generally greater than in the same month of 1949. Although production was higher (with the exception of primary refined copper) there was a considerable reduction of stocks.

Details from the summary issued by the British Bureau of Non-Ferrous Metal Statistics showed closing stocks at the end of October in long tons were: Blister copper 39,271 (52,568); refined copper 81,140 (91,299); zinc in concentrates 43,462 (39,886); slab zinc 40,981 (65,114). Lead, however, improved, imported virgin stocks being 63,829 (57,848) and English refined 8215 (2277).

There was again a marked increase in the export of tin, the total figure being 1168 long tons as against 724 long tons in October, 1949, and 1118 long tons in September this year.

UNWROUGHT COPPER

Long Tons

	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers'	41,626	79,762
Imports	9,002	18,597
PRODUCTION:		
Primary	—	9,475
Secondary	1,280*	6,572
CONSUMPTION:		
Primary	9,605	28,935
Secondary	—	18,265
Exports	1,027†	4
CLOSING STOCKS:		
Govt. and consumers'	39,271	81,140

* Rough copper.

† Includes 326 tons of rough copper despatched to Belgium and 701 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	27,299 long tons
Alloyed copper products	28,131 ,, ,,
Copper sulphate	5,624 ,, ,,

UNWROUGHT ZINC

Long Tons

	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers' .	43,071	48,414
Imports	13,124	7,768
PRODUCTION:		
Virgin and remelted	4	5,607
CONSUMPTION:		
Virgin (incl. debased)	6,737	21,212
Remelted and scrap	—	8,651*
Exports and re-export	—	11
CLOSING STOCKS:		
Govt. and consumers'	43,462	40,981

* Includes a small quantity of zinc concentrates consumed directly for chemicals, etc., which is also included as consumption of concentrates.

LEAD

Long Tons

	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS:				
Govt. and consumers' ...	—	64,105	7,104	—
Other stocks ...	55	—	—	—
IMPORTS	—	14,592	—	197
PRODUCTION ..	292	—	7,551	—
CONSUMPTION ...	270	14,259	6,440	8,432
EXPORTS	—	16	—	—
CLOSING STOCKS:				
Govt. and consumers' ...	—	63,829	8,215	—
Other stocks ...	77	—	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	7,839
IMPORTS	600
PRODUCTION	—
CONSUMPTION	1,942
EXPORTS AND RE-EXPORTS	1,168*

* Exports total 1168 tons, of which to U.S.A. 654; Egypt, 75; Sweden, 53; Syria/Lebanon, 51; S. America, 48; Germany, 47; Netherlands, 45; Canada, 45.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	552
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	356

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	43 55

New Australian Directory

RECENT expansion of the Australian chemical manufacturers is indicated in the second edition of the Directory of Industrial Chemicals, which shows that 199 new chemicals are now being made locally.

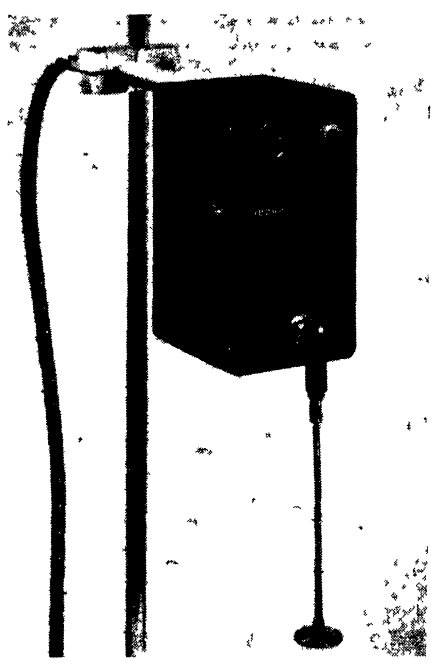
The first edition, published two years ago, by the Department of National Development, showed that 585 chemicals were then being made by 180 manufacturers. Although 68 of these chemicals are no longer made, the total now being manufactured is 712, and the number of registered manufacturers has increased to 188.

In 1939, the industry, including the section making explosives, comprised 250 factories, employing 8100 persons. By June, 1949, there were 408 factories, employing 14,611.

The directory is the only one of its kind published in Australia and may be bought from the Australian Trade Press Agency, 15 New Bridge Street, London, E.C.4 (7s. 6d.).

New Laboratory Equipment

GELATION time may now be estimated by means of a gelation timer, developed by Techne (Cambridge), Ltd. The new instrument is self-indicating and may be left working over-night or at week-ends, without attention. A weighted disc or rod is immersed in the oil under test and subjected to a simple harmonic vertical motion by means of a synchronous electric motor. As the liquid sets, a point is reached when the stiffness is sufficient to support the disc or rod during a 30 seconds half-cycle. When this occurs, the connecting link is compressed and operates a relay, stopping the motor and lighting a small neon lamp to attract attention. The gelation time may then be read off on the counter. Experiments on a range of urea formaldehyde and resorcinol formaldehyde adhesives have shown the results obtained with the gelation timer to agree closely with directly observed results.



[By courtesy of Techne (Cambridge) Ltd

The Gelation timer for oil testing

A ROTATING balance for weighing large samples in the laboratory has been produced by J. W. Towers & Co., Ltd., Widnes. This balance, model No. 7, can have either a flat or scoop pan. It will weight up to 6 kilos and is sensitive to 0.5 gm. No weights are necessary under 1 kilo. The rotating weight arrangement covers the range 0-1000 gms., and each division on the weight is 0.5 gm.

[By courtesy of J W Towers & Co, Ltd.

Rotating-weight balance model 7. The rod carrying the rotating weight is screw threaded on the top only, which enables the weight to be moved from one end of the rod to the other by lifting it slightly. Final adjustment is made by rotating the weight on the screw thread

A NEW range of externally fan-cooled, flameproof electric motors is announced by the Electrical Power Engineering Co. (Birmingham), Ltd., in its leaflet No. 7750. The design, which has been thoroughly tried out in the chemical industry and by leading oil companies, is particularly suitable for pumps, compressors, mixers and centrifugal fans.

* * *

DESIGN, machining and finishing of stainless steel castings are the subject of a well-illustrated brochure issued by Paramount Alloys, Ltd. Special reference is made to a general purpose alloy of the molybdenum bearing type developed with the co-operation of the parent concern, the A.P.V. Co., Ltd.

* * *

THE rôle of aluminium in the rubber industry is vital and varied. It has a natural resistance to the corrosive action of chemicals as well as an absence of rust, and no impurities of any kind are imparted from aluminium to the latex or coagulum. The importance of the metal as an aid to production is described in "Aluminium News" for November, published by the Aluminium Union, Ltd.

METALLIC SOAP DRIERS

METALLIC soaps made from 2-ethyl hexoic acid or α-ethyl caproic acid are gaining acceptance as paint driers on account of their uniformity, light colour, freedom from objectionable odour and lower non-volatile content at the same metal content as the naphthenate driers. It is now realised that the straight naphthenic acid salts although greatly superior to the older types of driers, such as the oleates, linoleates, resinates, etc., possess certain inherent disadvantages which are extremely difficult to correct even when special additives are added to the paints or an excess of acid is present. To some extent the driers based on 2-ethyl hexoic acid, known as octoates, overcome some of the defects of the naphthenates and it is convenient to summarise the advantages as follows:—

1. Naphthenic acid is a generic term applied to the whole family of organic acids which occur naturally in crude petroleum. The acids obtained from different petroleum sources differ in composition, thus making uniformity of drier difficult to attain.

2. 2-ethyl hexoic acid is a synthetic product, constant in properties. Its molecular weight is 144.12, specific gravity 0.903 at 20 deg. C.; melting point <0; boiling point 223 deg. C. This means that metallic soaps made from the acid can be standardised to a greater degree than is possible with variables such as naphthenic acid.

3. Although in general the octoates behave in a similar manner to the naphthenates and can be used pound for pound with the latter, in some alkyd formulations they are claimed to be superior. Paint manufacturers in the U.S.A. have reported that the octoates show a tendency to stain less than the naphthenates, give appreciably faster dry times and are more stable in solution. Under adverse drying conditions of high humidity the octoates are very effective and there is evidence to show that loss of drying time due to pigment absorption is completely eliminated by the use of those driers.

Lead, cobalt, manganese, zinc, calcium, cadmium, strontium, iron and copper octoates can be made from 2-ethyl hexoic acid in petroleum solvent. The same metal contents are made in the naphthenates and the octoates and, in general, the two classes of driers find parallel uses in paint manufacture. It is satisfactory to note that octoates do not form sludge or precipitates on storage and they are free-flowing at both high or low temperatures.

Paint technologists consider it likely that driers made from 2-ethyl hexoic acid will receive special consideration by manufacturers for use in new formulations based on the alkyds. In maleic—dehydrated castor oil varnishes; the octoates are particularly suitable and are superior to the naphthenates on account of their faster drying times.

Smoke Prevention in U.S. Plant

THE problem of smoke abatement was carefully considered in the construction of the National Works of the United States Steel Corporation's National Tube Company, at McKeesport, Pennsylvania, which includes five new smokeless stacks.

Two modern gas washers and companion electrostatic precipitators for cleaning gas from the blast furnaces were installed for use in the mill's new high-pressure boiler plant.

A further anti-smoke development was the erection of dust collectors. These virtually eliminate the fly ash coming from the boiler stacks when coal is used for fuel instead of the blast furnace gas. The coal is pulverised to a powder and the small amount of remaining fly ash is trapped in a system of filters between the boiler furnaces and the stacks.

Gas from the four blast furnaces is now cleaned in two stages, first through the gas washers, then in the precipitators. Inside the washers, the gas is cleaned by a multiple battery of water sprays, which wash out minute particles of iron dust. The dust content of the gas entering the boilers is reduced to about one hundredth of a gram per cubic foot.

The dust recovered from the furnace gas is collected as sludge in a 90 ft. circular thickening tank. The minute iron-bearing particles are then "caked" and re-used in the blast furnaces. By this method the plant is expected to recover about 100 tons of iron ore every 24 hours.

The British Tar Confederation has elected the following officers for 1950-51: President, Colonel H. C. Smith, C.B.E.; hon. treasurer, Mr. C. E. Carey; chairman, Sir Walter Benton Jones, Bart.; vice-chairmen, Mr. W. K. Hutchison and Major A. G. Saunders.

G. LEWI, D.Sc. Chem. Eng. (Prague), M.I.Chem.E., M.Inst.F., has recently been co-opted to the board of directors of Britannic Alloys, Ltd., as technical consultant.

THE CARRIAGE OF DANGEROUS CHEMICALS

SPECIAL regulations exist on British Railways by which products and materials for carriage by rail are classified according to their particular hazard, viz., explosive, inflammable, corrosive, poisonous, etc. These regulations appear in a special publication known as the *Dangerous Goods Classification.*

Each category of traffic has its own regulations which stipulate the form of packing acceptable and indicate which of the required special labels are to be affixed. The labels, which have either coloured background or coloured letters, not only show the nature of the hazard but give simple directions to the railway staff concerned in the handling and loading of the materials. For example, packages containing inflammable liquids which have a flash point below 73° F. must be labelled "Highly Inflammable"; dangerous, corrosive and poisonous chemicals, according to the nature and degree of hazard, are labelled "Poison. Not to be loaded with foodstuffs or foodstuffs empties"; "Keep far apart from foodstuffs"; "Not to be loaded with acids," etc.

Because British Railways are not common carriers of dangerous goods it is usual in the case of new products for traders initially to submit samples. These are examined by competent railway chemists who determine in which of the foregoing categories they fall and the form of packing most suitable. Where the characteristics of a particular commodity make it desirable, consultations take place between Railway and H.M. Home Office. Considerations take into account the safety of the public and users of the railway, railway personnel and property, and the protection of other goods in course of transit. In this way the dangerous goods classification has kept abreast with modern development; new entries being made and, where necessary, earlier ones modified. Discounting the index, general regulations and bye-laws the classification has grown from a document of about 30 pages in 1900 to over 100 pages at the present time.

The effectiveness of railway regulations can best be judged from the fact that it is very rare that incidents occur in which dangerous substances are involved during transit. One need only pause for a moment and reflect on the railways' record during the late war when considerable quantities of dangerous traffics were in evidence. Such rare criticism as is made of railway conditions governing dangerous goods is usually to the effect that they are too onerous, and the required standard of packing too high.

Requests for materials to be accepted in sub-standard packages are dealt with on merits; where the packages are considered suitable to withstand normal conditions of transit they are accepted and kept under review.

As a general practice, dangerous goods are not accepted for carriage by passenger train although this service is used for samples or small quantities of certain products.

Recent additions to the classification of dangerous goods have included:—

INFLAMABLE LIQUIDS

Class A, i e., flashing below 73°F.

Proply Nitrate.*

Completely soluble in water, and compositions made therewith (flashing below 73°F.)

Isopropylamine
Tetrahydrofuran

Class B, i e., flashing below 150° F but not below 73° F

Butyl Titanate

DANGEROUS, CORROSIVE AND POISONOUS CHEMICALS

Section I

Aceton Cyhanhydrin
Para-nitro-benzoic Acid.

PERMANENT GASES

Compressed Carbon Tetraflouride

Instrument Industries Exhibition

THE first British Instrument Industries Exhibition will be held in London next year at the National Hall, Olympia, from July 4-14.

Coinciding as it does with the Festival of Britain, it is hoped that the exhibition will provide on opportunity of showing to the world the high quality of British scientific and industrial instruments.

Members of associations which are supporting the exhibition have a prior claim for stand space, but non-member firms are welcome to take part on application to the organisers, F. W. Bridges & Sons, Ltd.

Firms giving their patronage and active support are: The Scientific Instrument Manufacturers' Association of Great Britain, Ltd., The British Lampblown Scientific Glassware Manufacturers' Association; The British Industrial Measuring and Control Apparatus Manufacturers' Association; The British Electrical and Allied Manufacturers' Association; and the Drawing Office Material Manufacturers' and Dealers' Association.

The Chemist's Bookshelf

TITANIUM : ITS OCCURRENCE, CHEMISTRY AND TECHNOLOGY. Jelks Barksdale. 1949, New York: The Ronald Press Company. Pp. xii + 591. Figs. 15. $10.

The author, who for a number of years has been engaged in research on titanium, has been impressed by the lack of a comprehensive working reference volume on this element. Recently, titanium has come to the fore as an important industrial element, and the importance derived from its growing range of applications is reinforced by its widespread occurrence. An attempt has been made to make this book completely comprehensive and detailed, except in the chapter dealing with the analytical chemistry of titanium, where the approach is more general.

Broadly speaking, the first 40 pages are concerned with the occurrence of the element, and these are followed by 70 pages devoted to the chemistry of the element and its compounds. About 300 pages discuss every phase of titanium compounds in the pigment industry, this being by far the most extensive section. The metal industries are dealt with in about 40 pages, while uses of titanium and titanium compounds in the electrical industry, and for ceramics, mordants and dyestuffs, catalysts, etc., occupy about 30 pages.

The extent to which the author's claim to completeness can be substantiated may be judged from the fact that the literature references, which are arranged by chapter in a final section, occupy no less than 78 pages, although printed in smaller type than the body of the book. There is a comprehensive subject index, but in view of the vast range of literature cited the addition of an author index would also have been very useful.

It is inevitable that a volume with such an aim should be uncritical. This explains the inclusion of references to such things as " induction valence " in the section on titanium, peroxides, and the variations without any directive as to the most acceptable value, in the figures quoted for some physical properties. However, random consultation on a wide range of topics connected with the element brought to light no obvious gaps in the subject matter.

Although relatively free from typographical errors, the book is not completely so. A curious instance appears on p. 47, where, within 19 lines, " isotypes " occurs twice, " isotropes " twice and " isotopes " twice—suggesting a lavish impartiality.

This book will provide a valuable source of information for all those interested in any aspect of the chemistry or technology of titanium.—C.L.W.

SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE. W. Theilheimer, 1950, S. Karger A.G., Basle, Switzerland. Pp. xi + 360. S. Fr. 37.

This book is the fourth of a standard series, and continues the work of the previous volumes in collecting organic synthetic methods over the period of one year. Essentially it consists of abstracts from papers published in 1947 and 1948, with supplementary references from 1949. Reaction titles from the preceding volumes are included, together with new references. The alphabetical index has been limited in this book, because volume 5, which is to be published in English, is intended to contain a cumulative index and also all the reaction titles given in the previous volumes.

Compared with its predecessors the present book has the great advantage of giving directions to the complicated methods and system of classification of reactions and additional characteristic reagents. A key to the index, in English, is included. Also in English is a convenient survey of reaction symbols, as well as separate supplementary references.

The editorial preparation of the book has been subsidised by substantial grants from leading American chemical firms and the author acknowledges their generosity and interest in this promotion of chemical literature. Because it gives a continuous record of new organic syntheses and of standard methods and subsequent improvements, this collection should prove a useful supplement to the Beilstein series. —F.N.

PERSONAL

THE City and Guilds of London Institute announce the following appointments:—

Honorary treasurer: SIR GEORGE ALWYNN, Bt. *Vice-presidents*: PROFESSOR R. S. HUTTON, DR. W. T. PRIDEAUX, and SIR HENRY A. STEWARD who was chairman of the technology committee from 1931 until 1946.

DR. A. R. LEE, A.R.C.S., D.I.C., F.Inst.P., has been appointed a deputy director of road research, DSIR. He will have the rank of deputy chief scientific officer.

Since 1937 Dr. Lee has been in charge of the bituminous section of the road research laboratory, and during this period many advances in the knowledge of the properties and uses of bituminous binders have been made. He and his colleagues have also established the nature of the destructive effect of atmospheric oxidation on bituminous surfacings generally.

The doctor was educated at Portsmouth Municipal College and the Royal College of Science, which he entered as a Royal Scholar. He joined the staff of the chemical research laboratory, DSIR, in 1924. In 1934 he was tranferred to the road research laboratory.

From 1947 to 1949 Dr. Lee was chairman of the road and building materials group of the Society of Chemical Industry.

The Institute of Physics announced the election on November 16 of three new Fellows and 11 associates. In addition 27 graduates, 18 subscribers and 81 students were elected. The new Fellows are:—

M. R. GRIDLEY (Chelmsford, Essex); J. W. SHARPE (Runcorn, Cheshire); and R. S. T. KINGSTON (Australia).

PROFESSOR E. D. ADRIAN, O.M., was last week elected president of the Royal Society in succession to SIR ROBERT ROBINSON who has held the post for five years. Professor Adrian has held the office of foreign secretary to the Royal Society since 1946. His work has been mainly concerned with investigations on the central nervous system and the whole subject of electroencephalography rests almost entirely on his fundamental work.

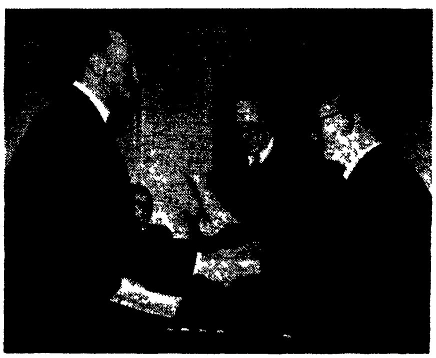
A PROUD record of long and loyal service was recognised on November 30 at a meeting held in the staff restaurant of Johnson, Matthey & Co., Ltd., Hatton Garden, London, the well known refiners and manufacturers of gold, silver and the platinum metals.

In instituting a scheme of long service awards, the company had decided to make appropriate presentations to employees on the following basis:—

On completion of 20 years' service the sum of £15 free of tax; on completion of 30 years a further £25, together with a Certificate of Service bearing the company's seal, and on completion of 40 years a gold watch.

At this first presentation a total of 370 members of the staff and works had qualified for one or more of these awards, 112 employees having completed 30 years and a further 33 more than 40 years' service. Of this last group two members had achieved no less than 50 years' service with the company.

Mr. H. W. P. Matthey, chairman of the company, in presenting the awards said that he was gladly mindful of the faithful and loyal service they had given, and that it meant very much to him that there could still exist the happy relations of which the ceremony was symbolical.



Mr. H. W. P. Matthey, chairman of Johnson, Matthey and Co., Ltd., presenting a gold watch and Certificate of Service to Mr. W. F. Tacon, who has completed 50 years' service with the company

· HOME ·

Long Service Awards

Over 100 employees of Lever Brothers and Unilever, Ltd., were presented with inscribed gold watches on November 27. The watches, which were given for fifteen years' good service, were presented by Sir Geoffrey Heyworth.

Houses for Atomic Workers

Up to 30 houses will be provided by Golborne U.D.C. in the Culcheth area for families of scientific workers coming to work at Risley atomic research department, near Warrington. The Ministry of Health has told the council that their housing programme for 1951 will be increased accordingly.

New Wharf for Oil Port

Building of a new wharf as part of the development of a 57-acre site owned by Associated Ethyl Co., Ltd., has begun at Stanlow, Ellesmere Port. The company's activities are closely linked with the development of Ellesmere Port as one of Britain's great oil centres. The new wharf will have a frontage of 600 ft. to the Manchester Ship Canal and will be able to accommodate ocean-going vessels.

Tin Prices Easier

A general fall in quo'ations for tin occurred on the London Metal Exchange during the week. After a drop of £55 on December 1, cash was quoted at £1065-£1075 a ton and three months fell by £50 to £975-£980. Prices were again easier on December 4 with cash at £1037 10s. and three months £967 10s. Tin for delivery in late February was sold at £1000.

Coated Paper for Rust Prevention

Trials carried out by the Austin Motor Company with Shell V.P.I. coated paper, supplied by Leonard Stace, Ltd., Cheltenham, and R. A. Brand & Company, are the subject of a recent report by Shell Chemicals, Ltd. The problem was to prevent the rusting of pressed steel parts packed for export without elaborate preparation prior to packing, and subsequent expenditure on cleaning at the receiving plant. Trial packs were prepared with Shell V.P.I. coated paper interleaving steel parts packed as received from the pressing shop, and these packs were shipped to India, Australia, and South Africa. The success of these trials may be gauged by the fact that the Austin Company is now dismantling an expensive rust prevention plant which has been in use for less than a year.

U.K. Aluminium Supplies

Mr. G. Strauss, Minister of Supply, announced in the Commons on December 4 that "supplies of both virgin and secondary aluminium are fully adequate to meet the defence programme."

New Works in Operation

Expansion in production of chemical, analytical and pharmaceutical balances is announced by William A. Webb, Ltd. The company is now installed in its new works at 1-9 Perrymans Farm Road, Newbury Park, Ilford. (Telephone: Valentine 6870.)

Science Masters' Association

The jubilee meeting of the Science Masters' Association will be held in the physics department of the Royal College of Science, South Kensington, from January 2-5, 1951. Among the items in the trade exhibition, W. & J. George & Beker will be showing a wide range of scientific apparatus, including balances for student use, and an improved type of precision magnetometer.

Seaweed Tests

The Scottish Seaweed Research Association is carrying out tests with a new quick-drying process at Kenton, Suffolk, with a view to establishing similar plants—if successful—in the West of Scotland. A consignment of 14 tons of West of Scotland seaweed has been dispatched to Kenton to initiate tests with the equipment. Meantime, research work on seaweed is continuing in several Scottish areas. The seaweed industry is gathering impetus under the continued attention of several organisations and companies, and is now the subject of research work in a number of laboratories in Scotland.

Anodising Process for Industry

Following a settlement of a claim between the Ministry of Supply and Alumilite & Alzak, Ltd., two patents concerned with sulphuric acid anodising of aluminium, which were assigned to the Ministry of Supply in February this year, have been allowed to lapse. The patents are: *British Letter Patent No.* 474,609—Improvements in and relating to colouring treatment of anodic coatings of aluminium and its alloys. *British Letters Patent No.* 476,161—Improvements in or relating to the anodising of aluminium and its alloys. The inventions of these two patents have been available to industry in this country since April 30, 1950.

OVERSEAS

Synthetic Fibres in East Germany

A pilot plant for the manufacture of Perlon is reported to have begun operations in Premnitz, Eastern Germany. Large-scale production is expected to start early next year.

More Phosphates from French Morocco

A scheme for a large-scale investment of French francs in order to increase phosphate output in French Morocco to four million tons a year by 1952 is being considered by the Office Chérifien de Phosphates.

Copper Shortage in Switzerland

World rearmament is causing a serious shortage of copper in Switzerland, it was stated this week by the Swiss Government. Substitutes should be used wherever possible, and it was announced that a system of permits to use copper would be instituted.

More Swiss Dyestuffs Exports

Exports of dyestuffs from Switzerland have increased in value from Fr.20.7 million in September to Fr.22.1 million in October. Exports of industrial chemicals rose from Fr.7.5 million to Fr.8.1 million, but shipments of pharmaceutical products declined somewhat.

Fire Resisting Paint

A new paint, which shrivels into a fine black ash under heat, but will not burst into flame, has been produced in the U.S.A. especially for the interiors of ships to reduce the hazards of fire at sea. The paint, which is fast drying and resistant to corrosion and abrasion, is claimed to retard the spread of fire.

Methane Reduction of Zinc Concentrates

The conventional method for smelting zinc in horizontal retorts may soon be superseded by a new process developed by the U.S. Bureau of Mines. In recent years, silicon carbide retorts with much better heat-transfer characteristics than fire clay have been supplanting the old retorts, but the practical impossibility of recovering the carbon monoxide formed in the reduction causes a large loss of fuel. The new method entails reduction of zinc oxide by passing methane through a bed of zinc sinter at 1000-1050° C. A pilot plant for the experimental gaseous reduction of zinc has been erected at Rolla, Mo. Results of the experiments have just been published in Bureau of Mines Report of Investigations 4730.

Chilean Iodine Price Increased

The Chilean Nitrate and Iodine Sales Corporation has increased the price of raw iodine by U.S.18 cents to U.S.$1.70 per lb.

New Sulphur Works in West Germany

Production of sulphur at a new plant, with a daily output capacity of five tons of pure sulphur, has recently been started by the Gelsenkirchner Bergwerks-A.G., Essen.

Swiss S.C.I. Meeting

The Swiss Society of Chemical Industry recently held its 70th annual general meeting in Basle. Professor Taddeus Reichstein read a paper on the heart-stimulant glucosides, on which he has been carrying out research.

Phosphorus Research Laboratory

A laboratory for research on phosphorus is to be built by the U.S. Government near Sheffield, in the Muscle Shoals area. A contract for construction of the project has been concluded with the Kellex Corporation of New York.

Hungarian Fertiliser Production

Output of fertilisers in Hungary in 1949 reached a total of 140,000 tons, an increase of 55,000 tons over the pre-war production. A further rise in output is shown in the first six months of this year for which the total aimed at 500,000 tons.

U.S. Sulphur in September

The U.S. Bureau of Mines reports that the U.S. domestic industry produced 446.245 tons of sulphur during September. Shipments reached 533,437 tons, a record for any month. At the end of September, producers' stocks had fallen to 2,835,688 tons.

Polish Scientist's Anniversary

A meeting to commemorate Jendrzej Sniadecki, the Polish scientist, was recently held in Warsaw by the Warsaw Scientific Society. It is 150 years since the publication of Sniadecki's "Beginnings of Chemistry" which formed the basis of much chemical development in Poland.

Vinyl Plastic Stencil

The facsimile process, employing electrical impulses, has been applied in America to transferring office forms, layouts, and engineering drawings to a vinyl plastic stencil for mimeographing. The system, which eliminates hand-cutting of stencils, takes only about six minutes and the plastic stencil, it is claimed, can make more than 10,000 copies.

Next Week's Events

MONDAY, DECEMBER 11

Royal Institute of Chemistry

London: School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. D. H. Bell: "The Manufacture of Inorganic Chemical Reagents."

Society of Chemical Industry

Leeds: Chemistry Lecture Theatre, The University, 7 p.m. Dr. L. A. Jordan: "Paints, Surface, Finish and Design."

Institute of Fuel

Liverpool: Municipal Annexe, Dale Street, 2.30 p.m. W. V. Battcock: "The Coal-fired Open-cycle Gas Turbine."

Institute of Metals

Glasgow: 39 Elmbank Crescent, C.3, 6.30 p.m. J. D. Glen: "Non-ferrous Metals in the Locomotive Industry."

TUESDAY, DECEMBER 12

Hull Chemical and Engineering Society

Hull: Church Institute, 7.30 p.m. Dr. N. Gebbie: "Science and Public Health."

The Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. Ir. Hoog: "The Development of Catalysts in Industrial Chemistry."

Society of Chemical Industry

Liverpool: Chemistry Lecture Theatre, The University, 6.30 p.m. Prof. T. P. Hilditch: "The Fats: 1900-1950. An essay in historical chemistry."

Institute of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. Dr. C. M. Blow: "The Testing and Grading of Raw Rubber."

WEDNESDAY, DECEMBER 13

Society of Chemical Industry

Birmingham: The University, Edmund Street, 6.30 p.m. A. R. Lockwood: "Dextran Blood Plasma Substitute."

London: Burlington House, Piccadilly, W.1, 6.15 p.m. Meeting of the Food Group. "Factors in Distribution Affecting the Quality and Nutritative Value of Foodstuffs."

Plastics Institute

Glasgow: Institution of Engineers and Shipbuilders, 39 Elmbank Crescent, C.2, 7.30 p.m. Dr. V. Stannett: "Cellulose Acetate Moulding Powders and Future Developments."

Society of Dyers and Colourists

Nottingham: Victoria Station Hotel, 7 p.m. A. L. Horobin: "Textile Applications of the Amino Resins."

THURSDAY, DECEMBER 14

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. H. R. Cooper and H. W. Melville: "The Oxidation of *n*-Decaldehyde." Other papers by R. M. Barrer, E. A. White and D. C. Jones.

The Textile Institute

Kidderminster: Staff Canteen, Carpet Trades, Ltd., 7.30 p.m. R. H. K. Thomson: "Ardil."

Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.30 p.m. Prof. E. G. Cox: "Electrostatic Hazards in Industry."

Nottingham: Technical College, 7.15 p.m. R. C. Chirnside: "Analytical Chemistry, Chemical Analysis and the Analyst."

Edinburgh: North British Station Hotel, 7.30 p.m. Dr. E. M. Dodds: "Modern Trends in Fuels and Lubricants."

Institute of Metals

Sheffield: Grand Hotel, 6.30 p.m. R. Haynes: "The Isothermal Transformation of Copper-Base Alloys."

Incorporated Plant Engineers

Maidstone: Lecture Theatre of the Maidstone Technical College. T. W. Palk: "Thermostatic Control."

FRIDAY, DECEMBER 15

Electrodepositors' Technical Society

Sheffield: Grand Hotel, 6.30 p.m. E. A. Ollard: "Heating and Filtration of Solutions."

To Study Drying

THE Institute of Fuel has organised a series of meetings to discuss the methods and principles involved in the drying of materials. The first of these meetings was held on December 5, when two papers were read, including "Estimation of Moisture" by A. H. Ward, which appears in this issue on page 783. Further meetings will include papers on the drying of sand and fuel; drying technique; drying in the pottery industry; drying in the textile, paper and allied industries; drying of animal by-products, drying of pastes, powders and crystals; drying of liquids, solutions and slurries and drying in agriculture.

The Stock and Chemical Markets

MARKET setbacks due to the serious Korean developments have not been followed by a return of buyers, although selling has ceased and there is a generally firmer undertone, awaiting the result of Mr. Attlee's mission to the U.S.

British Funds have again moved lower partly due to revived talk of the possibility that a big defence loan will have to be floated early in 1951. Industrial shares have failed to attract at the recent reduced levels. Sentiment has been affected, not only by the prospect of higher taxation next year, but by the possibility of drastic rationing of materials for industry unless the U.S. makes available larger supplies of metals and similar requirements for the British arms drive. Even armament shares have failed to attract buyers despite general confidence that their dividends will be maintained.

Chemical and allied shares have moved back with the general trend on the Stock Exchange, although they have recently turned steadier, and, on balance, movements in many cases have not been more than a few pence. Imperial Chemical were 41s. 10½d., Monsanto, 50s. 6d. and Brotherton, 21s. 3d., Fisons eased to 25s. 3d., and now yield over 7 per cent, while Albright & Wilson kept steady at 30s. 9d. Amber Chemical 2s. shares receded from 2s. 9d. to 2s. 6d., on the absence of an interim dividend, F. W. Berk were steady at 12s. 6d., Boake Roberts, 34s. 9d., Bowman Chemical 4s. shares, 5s. 9d., and W. J. Bush were firm at 80s. Laporte Chemicals 5s. units were 10s. 3d.

There was again a good deal of activity in Glaxo Laboratories around 57s. Buyers took advantage of any decline in price because of prospects of a higher dividend and an offer of additional shares to shareholders on attractive terms when more capital is required. Despite market hopes of a higher dividend, Turner & Newall, at 83s., have come back further with the general trend, but Triplex Glass, at 26s. 9d., regained part of an earlier decline. United Molasses have been active around 46s. 3d., but the 4s. units of the Distillers Co. turned easier at 19s. 3d. Associated Cement eased to 78s. 9d., Goodlass Wall to 38s. 9d. and British Plaster Board 5s. units were 14s. 3d.

British Oxygen, at 86s. 3d., showed firmness on the success of the new issue, but Dunlop Rubber came back to 51s. 7½d. British Aluminium at 38s. 3d. turned firmer after their recent decline. British Glues 4s. units, at 22s., lost part of their rise. Levers, at 41s. 9d., rallied moderately. Among plastics, British Xylonite came back to 81s. 3d., De La Rue were 28s. 6d., British Industrial Plastics 2s. shares, 5s. 9d., and Kleemann, 9s. 9d. Tube Investments have been active again around £6¼, awaiting the new issue terms.

Boots Drug, were lower at 48s. 6d. Beechams deferred, around 13s. 6d., and Borax Consolidated at 55s. 6d., were again a firm feature. United Glass Bottle at 77s. 6d., remained firmly held. British Celanese eased to 23s. 9d. although there is confidence that new capital, when required, is likely to be raised by an offer of additional shares to shareholders at attractive terms.

Oil shares were inclined to lose ground, although Anglo-Iranian at £5 15/16 regained part of an earlier decline. Shell were 65s., and Canadian Eagle rallied to 27s. 9d. on the success of the new issue.

Market Reports

STRONG price conditions with a persistent demand have characterised the industrial chemicals market for some months and the past week has been no exception. Buying for home and export continues at a good level and deliveries have been well maintained though a scarcity in available supplies is reported for some items. The shortage of drums is an additional handicap to prompt deliveries. Among the soda products, sodium sulphide is in steady request and chlorate of soda supplies are readily absorbed. There is no change in the potash chemicals all of which are firm on a keen demand. The effect of the restricted supply of sulpur on current supplies of sulphuric acid is becoming more evident and a reduction in output over a considerable period appears to be inevitable. Formaldehyde is firm on a good demand while acetone supplies are barely sufficient to satisfy requirement. The call for tartaric acid and cream of tartar remains good at the higher quotations now ruling. There has been no further change in the basis prices of the lead oxides and the demand continues on a good scale. Lead acetate and lead nitrate are being called for at the recently increased rates. An active demand with firm prices is reported on the coal tar products market with the naphthalenes in strong request. There has been

(continued at foot of following page

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AYLESBURY BATTERY & ELECTRICAL CO., LTD. (M., 9/12/50.) November 2, £2000 further charge (supplemental to a mortgage dated September 21, 1940) to Bucks Land & Building Co., Ltd.; charged on Sydenham House, 32 Havelock Street, Aylesbury. *£631. May 30, 1947.

Satisfactions

BRITISH DIESEL OIL & PETROL CO., LTD. (formerly L.T.C. DISTILLATES, LTD.), London, S.W. (M.S., 9/12/50.) Satisfaction November 7, of debenture registered April 4, 1938, to the extent of £6000.

YORKSHIRE DYEWARE & CHEMICAL CO., LTD., Leeds. (M.S., 9/12/50.) Satisfaction October 30, of amount outstanding July 1, 1908.

Release of Receivership

GRAPPENHALL CHEMICALS, LTD., 44 Brazennose Street, Manchester 2. E. C. Smith, of Faraday House, 17 Todd Street, Manchester 3, ceased to act as receiver on November 20, 1950.

Increases of Capital

The following increases of capital have been announced: CHEMICAL PLANT CO., LTD., from £1000 to £10,000; EBONITE CONTAINER CO., LTD., from £100,000 to £200,000.

Change of Name

The name of UNIVERSAL PROOFINGS, LTD., The Estate Office, Bromley Hill, Bromley, Kent, has been changed to L.D. PROCESSES, LTD.

Company News

United Kingdom Chemicals

Lord Brocket, chairman of United Kingdom Chemicals, announces that an agreement has been made with British Anthracite Sales, Ltd., for that company to acquire a 50 per cent interest in his company and United Carbon Black, Ltd. These companies, which jointly own a factory extending to some seven acres at Port Tennant, Swansea, have hitherto been privately financed. United Carbon Black, Ltd., is the first factory in Britain to have gone into production of carbon black.

New Registrations

Darcy Products, Ltd.

Private company. (488,672.) Capital £100. Importers, exporters, and dealers in chemical, oil and mineral products, etc. Directors: T. J. Clark, and G. M. Daintry. Reg. office: 175 Piccadilly, W.1.

Supra Chemicals and Paints, Ltd.

Private company. (488,890). Capital £20,000. Manufacturers of and dealers in paints, colours, varnishes, lacquers, bituminous paints, enamels, etc. Directors: O. Green and P. Neal. Reg. office: 9/11 Hainge Road, Tividale, Tipton.

THE STOCK AND CHEMICAL MARKETS

continued from previous page)

no easing in the demand for cresylic acid and the A.D.F. material is commanding as much as 9s. per gallon ex works.

MANCHESTER.—Textile and allied trades and other users of heavy chemicals are pressing for deliveries of a wide range of products, but growing scarcities of some chemicals have worsened the delivery position. During the past week a steady flow of new inquiries for alkali products, potash and ammonia compounds and miscellaneous chemicals has been reported. Buying interest on the part of the shippers has been maintained. Prices are firm in all sections and some fresh advances are anticipated. Most tar products continue to meet with a steady demand.

GLASGOW.—Business in the Scottish heavy chemical market has, in general, been steady. The export market has remained extremely quiet.

PROPOSED SCIENCE CENTRE

Participating Societies

NAMES of the scientific societies which had agreed to co-operate in the proposed new Science Centre in London were revealed by Sir Robert Robinson, retiring president, in his address at the anniversary meeting of the Royal Society last week.

The societies which had agreed to participate were the Biochemical Society, the British Association, the Chemical Society, the Faraday Society, the Geological Society, the Linnean Society, the London Mathematical Society, the Physical Society, the Physiological Society, the Royal Anthropological Institute, the Royal Astronomical Society, the Royal Society, the Royal Statistical Society, and the Society of Chemical Industry.

Proposals for the centre were outlined by the Lord President of the Council in the House of Commons on November 21. Although at present the famous landmarks that might be visible from the centre could not be revealed, Sir Robert Robinson said that the concurrence of the Royal Society and other bodies had been given.

The quarters for the various societies would be separate, with their own entrances, very much as at Burlington House. The scientific societies would retain their individual libraries, together with any system of classification to which they attached importance. There would be a Central Scientific Reference Library based on the patent Office Library. This and other activities would be housed in separate buildings.

In conclusion, Sir Robert said that he had seen no sign whatever of any attempt or desire to undermine the independence of the Royal Society or to make it subservient in the smallest degree to any material or political interest.

Cost of New Sulphur Plant

In the article "Sulphur Supplies Endangered" (THE CHEMICAL AGE, 63, 737) the statement that . . . "the cost of producing sulphuric acid . . . in the case of pyrites . . . is about three times as great as by the conventional processes, while the anhydrite method costs about six times as much" is misleading. The figures actually relate to the capital expenditure involved in the installation of new plant to produce sulphuric acid by these processes, and not to actual production costs.

DANGER TO CHEMISTS

Professor Gives Warning

THE danger that Britain might attempt to emulate the U.S.A. in its application of chemistry to industry—and thereby limit the attention given to fundamental science —was stressed at this year's Ramsay Chemical Dinner in Glasgow. Speaking on "The Profession of Chemistry," Professor A. R. Todd, Professor of Organic Chemistry at Cambridge University, indicated that his own graduates were being well nigh torn to pieces by industrialists, anxious to employ qualified chemistry graduates.

He approved the trend, and welcomed the growth of the chemical industry which he anticipated would continue to expand. But Britain must not emulate the United States in applying chemistry to industry. Main strength of British development had lain in fundamental science. New discoveries had developed from that attitude and there was now a danger that Britain was sacrificing quality for quantity. He urged a revival of interest and attention to fundamental chemistry and science as the method whereby a world wide reputation for new discoveries might be retained.

Other speakers were Walter Elliot, M.P., Prof. E. K. Rideal, Prof. J. W. Cook, and Baillie A. Donald, representing the Lord Provost.

Release of Nuclear Data

The public release of certain information on low power research reactors has recently been agreed by the atomic energy authorities of Great Britain, Canada and the U.S.A. A Ministry of Supply publication just issued, indicates the new categories of information now being released, together with some details.

Of most general interest is that low energy thermal neutrons are captured in appreciable quantities by uranium-235, without causing fission. Previously available information indicated that practically all thermal neutrons captured by U^{235} would result in fission. Now, however, it is revealed that a significant fraction of all thermal neutrons colliding with U^{235} are captured to form U^{236}, a factor to be borne in mind by engineers designing uranium reactors.

Aluminium from Italy?

Stocks of aluminium in Italy are reported to be so satisfactory that producers have asked the Government to allow exports to be resumed.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4

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The Shortage of Drums

THE shortage of steel drums is becoming increasingly serious and the position is deteriorating from week to week. Inquiries reveal that drum manufacturers are from three to six months behind with their orders, the reason being that factories are working at half capacity owing to reduced allocations of steel.

While the effects of the drum famine are being felt by many industries and trades, the chemical industry is among the principal sufferers because so many of its most important products are handled in drums. Already the home market is being deprived of essential supplies and export orders are delayed because the drum factories cannot meet demands.

Yet the chemical industry has been urged to increase its output and step up exports, particularly to dollar countries. The industry has responded magnificently to the dollar drive and it is ironical that its efforts should now be frustrated because there are not enough drums to cope with the increased production. This critical position has arisen just when chemical manufacturers had reason to be well satisfied with the results of their export drive.

But this is by no means the whole story. Apart from direct exports, chemicals are despatched—again in drums—to other home manufacturers for use in the production of various commodities, which are also exported on an extensive scale. In many instances the value of materials added far exceeds the value of the chemicals used. Thus a drum shortage at a single factory can stifle many other industries whose own products may not necessarily be sold in drums.

The Association of British Chemical Manufacturers has been making urgent representations to the Board of Trade, but the outcome is not yet known. It is understood that the matter has also been taken up by other affected trades.

Nobody seems to know just why allocations of sheet steel to drum manufacturers should suddenly have become so inadequate. Two reasons suggested are the effects of rearmament and increased steel consumption by the motor trade. The steel industry continues to break new records, but it is quite evident that sheet steel is still being consumed as rapidly as it can be produced. The position will no doubt be greatly eased when the new plant at Margam comes into production next year, but until the country's requirements can be met in full, some industries are bound to suffer, no matter

what system of allocations may be introduced.

There would nonetheless appear to be a very strong case for increasing allocations to drum manufacturers, even if this involved a slight reduction in supplies earmarked for other essential purposes. Britain's consumption of steel drums is believed to be five or six million a year, so that the tonnage involved is small in comparison with that of the largest sheet steel users. The opinion has even been expressed that the very welcome benefits resulting from increased motor car exports might be more than counterbalanced by the reduced shipments of chemicals, oils, paints and other commodities transported in drums.

It should be remembered, too, that nearly all major industries are to some extent dependent directly or indirectly on supplies which are delivered in drums. The motor car industry, for instance, uses enormous quantities of paints and varnishes. Many of the ingredients of these materials are delivered to the paint factories in drums. Thus it is conceivable that if the drum famine cannot be alleviated, the effects will eventually be experienced by the motor trade. Again, it is urgently necessary in the existing circumstances that the highest priority should be accorded to the rearmament programme, but even rearmament depends on drums for many of its essential requirements.

In certain industries the crisis may be eased to some extent by bulk deliveries to the larger customers, but this is clearly impossible in the case of small concerns whose aggregate purchases of material in drums are very great.

So widespread are the potential consequences of the drum famine and so damaging the repercussions on both home economy and export trade, that the plight of the drum factories and their customers seems to call for immediate action at the highest level. Means should be found for increasing steel allocations to manufacturers to quantities more nearly commensurate with demand. If this can only be achieved by robbing Peter to pay Paul, it should be remembered that in this instance Peter's prosperity is vitally dependent on that of Paul.

Technical and Scientific Register

The total number of persons enrolled on the Technical and Scientific Register at October 16 was 5575, which included 3936 registrants in work but desiring a change of employment and 1639 unemployed. During the five-week period September 12 to October 16, 529 vacancies were notified, 329 were filled and 387 cancelled or withdrawn.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes and Comments

The Future of Plastics

SOME revealing facts about the problems affecting the plastics industry in many parts of the globe were given by Mr. R. E. G. Windsor at a Press conference held in London recently, on his return from a 40,000-mile business flight.

The major factor affecting plastics in the U.S.A. was, he said, the shortage of raw materials, particularly polystyrene which originates from benzene. Benzene is now being appropriated for the synthetic rubber plants. Until it can be decided therefore, how much synthetic rubber will be required and the amount of benzene involved, the full effect on production of polystyrene cannot be foretold. Already two American chemical companies are working on a substitute for benzene for use in synthetic rubber plants. There is no shortage of polyvinyl chloride.

Extrusion of plastics, pointed out Mr. Windsor, was now in the stage reached by injection moulding in 1936. Extrusion was, however, of greater importance industrially and chemically, as injection moulding was mainly for decorative or luxury goods. In Japan, Windsor, Ltd., had supplied the first extrusion machines and there were great potentialities for plastics in that country.

Many new industrial applications in Australia were being rapidly developed, and despite a shortage of technicians there were good prospects for the plastics industry. India presented many problems, partly due to the fact that the people were not technically minded. On the other hand, Pakistan was determined to rise industrially and was making great strides forward. The new trading estate outside Karachi included very up-to-date plastic factories. Generally, it was found that there is a definite desire for British plant at the right price if it can be backed up by servicing and availability of spare parts, while in Asia and the Far East British firms must have home-trained technical representatives on the spot.

Appreciation Lacking

THE character and personality of the Chancellor of the Exchequer is of special interest and importance to the business world. More than any other minister, he touches the practical work of the nation at every point. The office ranks next to that of Prime Minister and the list of its holders before 1945 consists of names that the nation and the world have held in the greatest respect.

The young man who has now been chosen to carry on these great traditions, has not so far shown an adequate appreciation of his responsibility for behaviour befitting his robes. He surprised the House of Commons by refraining, in his first speech, from any reference to his predecessor and thus made a breach in a treasured Parliamentary tradition. Without any suggestion of approving the policies or practices of Sir Stafford Cripps, it can be agreed that he maintained the good manners if not all the dignity, of high office.

When some little time ago, as Minister of Fuel and Power, Mr. Gaitskell announced that he was giving up his daily bath, he was thought to be playing a little below the form expected from Winchester and Balliol, but was excused for a gaucherie which any youth may by mistake perpetrate when only, in fact, endeavouring to be funny.

When, however, last week he went the length of taunting Mr. Churchill, of all men on earth, with " lacking in humanity ", the new Chancellor disowned his educational advantages and joined forces with the vulgar minority of his colleagues. Even though in his forthcoming Budget Statement he may not use the gutter terminology of this low group, his victims must expect to find themselves treated as vermin whose opinions are worth less than a tinker's cuss.

SEVEN YEARS OF FUEL RESEARCH*

AT THE outbreak of the war the whole of the experience and information of the Fuel Research Board was held available for application to the war effort, and in a comparatively short time practically all of the staff were engaged on wartime programmes, widely varying in character.

Mention should be made in the first place of the immense advantage derived from the valuable information amassed by the Coal Survey, in the inter-war period, on the properties of the coal resources available in the country. The knowledge acquired by the Coal Survey provided a valuable basis for many of the projects attempted during the recent war, particularly those which were concerned with requirements of coal possessing special properties. In addition, much work was done by the Survey Laboratories in connection with the substitution of fuels to conserve certain types of coal and to eliminate all unnecessary transport. Assistance was also given to the sulphuric acid control of the Ministry of Supply in the recovery of pyrites from coal.

Petrol Substitute

The threat of war had caused several projects to be put in hand prior to 1939. In particular, work on the use of producer gas for road vehicles as a substitute for imported petrol was started at the Fuel Research Station as early as 1937, when the "Hartley" Committee was set up by the Minister for the co-ordination of defence. An intensive investigation was undertaken by a team of workers at the station, and other organisations undertook co-operative work. By 1940 the well-known Government emergency producer was evolved, and this was later improved and modified for mass-production as the Government utility producer.

In 1939 the Air Ministry arranged for the erection of hydrogen plants at gas works in various parts of the country. The Fuel Research Station had been producing hydrogen in full-scale plant for its programmes on the hydrogenation of coal and tar before the war, and the facilities and experience of the station were placed at the disposal of the Air Ministry, and a valuable and substantial contribution was made to the barrage-balloon defences throughout the period of the war.

In 1940 work on flame warfare was begun, to assist the petroleum warfare committee. Here again the station staff made a contribution of first class importance to the war effort. A team of workers carried out experimental investigations on incendiary materials for many purposes, including fougasses and flame-and-smoke barrages, but the outstanding achievement was the preparation of new highly-effective fuels for flame throwers, which were manufactured and used in large quantities.

Another important contribution was the development of smoke-eliminating devices for the elimination or reduction of smoke from the funnels of merchant ships. The same principles were subsequently applied on land to Lancashire boilers, and smoke-eliminator doors of the Fuel Research Station design are now being manufactured.

Another successful investigation undertaken, although not connected directly with the war effort, was that relating to the problems arising from the deposition of solid matter on the external heating surfaces of boilers at power stations. This work was carried out in co-operation with the boiler availability committee which consisted of representatives of the Central Electricity Board, the electricity-generating industry, manufacturers of water-tube boilers, and the British Coal Utilisation Research Association. Excessive formation of these deposits in power-station boilers necessitated frequent shutting-down of the boilers for extensive cleaning and has thus seriously decreased their 'availability.' With the shortage of generating plant, this has caused great concern to the electricity supply industry. It is satisfactory to find that the station's work has been of considerable assistance in alleviating the difficulties, and that it has been much appreciated.

Fischer-Tropsch Process

Finally, it should be mentioned that work on the Fischer-Tropsch process of synthesising oil from coal was continued throughout the war years although restricted to a small scale. The information obtained in this way enabled advice to be given to the Ministry of Fuel and Power on the possibilities of the process and to assist the Ministry of Economic Warfare in matters concerning the role played by the process in the war-time economy of the enemy nations. It was also of particular value in the planning and carrying out of the investigations of the Fischer-Tropsch industry in Germany in the spring and summer of 1945.

* A brief survey of "Fuel Research, 1939–1946," published by DSIR and available from H.M.S.O., 3s.

JAPANESE CHEMICAL RECOVERY

SOME idea of the extent of the war damage to Japanese chemical industries may be derived from the fact that in several cases capacity has been affected by as much as fifty per cent. The chief users of chemicals have also had their productivity considerably reduced; for example, rubber has fallen by 48 per cent, cement by 20 per cent, oil refineries by 58 per cent and wool textiles by 84 per cent.

Giving these facts and figures (*Chem. Industrie*, 1950, *2* (11), 553-5), Alexander Nagai, of Tokio, says that the original demolition and reparations policy of the Allies, as recommended by the Pauley Mission, extended far beyond war material factories. It was, however, subsequently modified on further consideration by the Strike and Draper Missions which stipulated the following approximate capacity limits (in 1000 tons)—nitric acid (54), sulphuric (4755), electrolyt. caustic soda (128.8), chlorine (118), soda 493), aluminium (151), magnesium (0.2), tar distillation (849), light oil distillation (187), celluloid (6), methanol (19).

Fuller details of the effect of war damage upon Japanese productive capacity may be assessed from Table 1.

TABLE I

	Pre-war capacity	War damage	Per cent.
Sulphuric acid			
Contact	2,564.5	86.4	3.4
Lead chamber ...	3685.7	818.9	22
Ammonia	511.1	226.5	44
Ammon. sulp. (synth.) ...	1,819	847	49
Calcium nitrate ...	321	8	2.5
,, carbide	376	6	1.6
Superphosphate ...	2,353.4	403.8	17
Hydrochloric acid ...	220.9	71.9	33
Caustic soda			
electrolyt	236.4	49	21
ammon. soda ...	415.8	208	50
Soda	889.2	342	39
Aluminium oxide ...	354.5	49.7	14
Coal tar	339.3	60.2	18
Benzol	93.4	25.6	27
Fatty acids	112.8	19.4	17
Hydrogenated oil ...	80.5	40.2	50
Soap	161.3	61.7	38

The entire demolition problem in Japan is still not finally settled. Prevalent opinion is that it will be still further lightened by the U.S. authorities. Several synthetic fuel factories—among which are three Fischer-Tropsch and three high pressure plants—and fertiliser factories may be spared. Food supply is the paramount need for Japan's huge population, so that the fertiliser industry takes pre-eminence.

Output of synthetic nitrogen already far exceeds that of pre-war as indicated by the figures for 1949: 1,147,522 tons ammon. sulphate (synth.), 84,648 tons by-product ammon. sulph., 6038 tons urea, (45 per cent N), 847,550 tons calcium nitrate (20 per cent N), and 188,560 tons ammon. nitrate (32 per cent N) But the total is still less than the estimated home demand of 2,152,000 tons. Superphosphate is still below pre-war output. In 1949, production was 1,281,473 tons. Imports of potassium chloride (40 per cent K_2O) of 261,217 tons amounted to only half the estimated need of 490,700 tons.

Marked Progress

On the other hand, production of calcium superphosphate (16 per cent P_2O_5) has increased rapidly during the past few years (in 1000 tons): 1947, 709; 1948, 955; and 1949, 1161. It is hoped that the nitrogen industry will, in future, be able to meet all home demands, and also provide a balance for export. Several orders for ammonium sulphate have been received in recent months from Thailand, Formosa, and Hong Kong.

Particular attention is being directed to the manufacture of triple-super, mixed fertilisers, and urea. For the last-named four factories are already engaged on the production of urea but only one supplies urea for fertiliser purposes, the output of the other three is apparently being used for plastics. The fertiliser factory is that of the Toyo High Pressure Works in Sunagawa, with an annual capacity of 15,000 tons. The other three, for plastics and synthetic resins, are much smaller. The erection of five new plants for urea contemplated, includes one for the Nisshin Chemical Works of Niihama, contract for which was given to the Chemical Construction Co., of New York, in July or August of this year. Production of ammonium chloride and phosphate for fertiliser use is also to be increased.

In other sections of the chemical industry progress has not been so marked, but nevertheless quite appreciable advances have been made. Taking the production index of 1932-36 as 100, it was 142.4 in 1943; 102.6 in 1948 and 188.5 in 1949. It is likely to be still higher for 1950. Actual output figures for some of the more important in the heavy chemicals group are given in Table 2.

TABLE II

	1936	1947	1948	1949
Soda ash	232	38	75	123
Caustic soda ...	299	43	107	145
Liquid chlorine ...	10	4	6	10.5
Calcium chloride ...	68	14	27	34
Sulphuric acid ...	2,891	1,489	1,950	2,582

In 1936, organic dyes amounted to

19,000 tons. For 1948 the figure was 5000, and for 1949, 6600 tons. For this year, if the export trade can be further stimulated, it is anticipated the output will be much greater.

Soap production is still far below requirements. It was only 25,000 tons in 1949 compared with the 1936 figure of 192,000 tons. In plastics and synthetic resins better progress is anticipated under American planning, especially for polyvinyl chloride. Insecticides are now sufficient to meet home demand, and this year it is hoped that exports of lead arsenate will reach 2000 tons.

BRAZIL'S TRADE WITH U.K.

DURING the first nine months of 1950 Brazil imported from Great Britain chemicals, drugs, dyes and colours to the value of £3,993,839; disinfectants and insecticides, £84,748; sodium carbonate, £423,870; caustic soda, £1,346,695; drugs, medicines, etc., £211,324; finished dyestuffs, £245,823; paper and cardboard, £439,179. The total value of imports from the United Kingdom amounted to £30,904,495, as compared with £33,976,000 during the whole of 1949.

During the period under review Brazil's exports to the United Kingdom of chemicals, drugs, dyes and colours amounted to £238,326.

Imports and sales of imported chemical products are now controlled in Brazil by the Central Price Commission. Stock lists are being compiled to prevent shortages and increased purchases abroad are expected. Importers and re-sellers may not add more than 30 per cent to the cost by way of profit. The list of controlled products includes nearly all the principal industrial and pharmaceutical chemicals.

Reserves of alkalis are low at the moment, presumably owing to the delay in granting licences to import from Britain, Brazil's principal supplier. Permits are to be granted more freely.

Local production of pyrethrum in Brazil rose to 2620 tons during the war, when about 1000 tons were exported annually to the United States. The price was fixed by agreement between governments at 35 and 26 U.S. cents per kilo for first and second quality flowers, respectively. After the war DDT and other new insecticides appeared on the market, causing the price for pyrethrum to drop to 16 cents; and planters in the State of Rio Grande do Sul lost interest. Later, a big demand in Brazil and orders from Argentina drove prices up to 28 cruzeiros (11/2d.) per kilo. Planting was immediately resumed and production in 1950 is expected to reach 13,000 tons.

Brazilian planters are now alarmed by the report that the Union Carbide & Carbon Corporation, of New York, is producing allethrin, which they claim contains no natural tars and resins to clog spraying equipment, and has less odour.

The Brazilian growers fear that it will be produced in large quantities and at a price which will discourage planting.

Steel Corrosion Tests

THE results of experiments on the corrosion of bare iron or steel in sea water have been described by Dr. J. C. Hudson, of the British Iron and Steel Research Association, in a paper in the *Journal of the Iron and Steel Institute* (*166*, 123). Minor variations in composition and structure, it was found, had no significant effect on the rate of corrosion of ordinary mild steels when immersed in sea water.

The results of tests with a wide range of elements added to low-alloy steels showed that only two (chromium and nickel) had an appreciable effect in reducing corrosion. Chromium had the greater steels with 2-3 per cent chromium corroded at one-half or one-third the rate of unalloyed steel influence.

There were indications—"the conclusions can be put no more strongly than this"—that corrosion of ordinary steels by sea water increased when their carbon content rose above 0.4 per cent and was greater for steels with high manganese contents. Some increase in corrosion resistance might result from the introduction of small percentages of aluminium or beryllium in the steel.

There was no conclusive evidence that the presence of copper alone in the steel had any beneficial effect, although it possibly might be of value when an increased percentage of phosphorus also was present. The presence of millscale was shown to promote serious pitting in seawater.

Dr. Hudson states that to confirm the effects of alloying steel with chromium and/or nickel, tests on large specimens rolled from full-scale commercial heats are needed, and that it would be at least of scientific interest to investigate further the effects of high carbon content, high manganese content, and of beryllium additions by tests of the same type.

LABOUR AND THE CHEMICAL INDUSTRY

NUMBERS of persons associated with the chemical and allied trades at the end of September were 458,000, an increase of 4000 over the figure at the end of August and 25,000 more than at the end of 1948, according to the analysis of civil employment in the *Ministry of Labour Gazette* (Vol. 58, No. 11).

Changes in the level of employment on the industrial analysis relate to employees only and exclude employers and persons working on their own account. The total numbers in Great Britain employed in chemicals and allied trades (in thousands) were 453.0 in September compared with 449.1 in August and 420.9 in mid-1948.

Detailed distribution for September was as follows (in thousands): coke ovens and by-product works 17.2 (16.7 men, 0.5 women); chemicals and dyes 206.5 (153.0 men, 53.5 women); pharmaceutical preparations, etc. 34.6 (13.9 men, 20.7 women); explosives, etc. 37.2 (22.6 men, 14.6 women); paint and varnish 39.0 (27.7 men, 11.3 women); soaps, candles, glycerine, etc. 50.6 (29.6 men, 21.0 women); mineral oil refining 36.6 (30.4 men, 6.2 women); other oils, greases, glue, etc. 31.3 (24.2 men, 7.1 women).

A rise in numbers employed was also noted in industries connected with the treatment of non-metalliferous mining products other than coal. The total figure for September was 319.4 thousand, which was 900 more than in August and 12,500 more than in mid-1948.

Unemployed persons (all classes) who were registered on October 16 showed 4969 (3324 men and 1645 women) in the chemical and allied trades, and 3510 (2732 men and 778 women) in the treatment of non-metalliferous mining products other than coal.

Union Membership Lower

Membership of trades unions associated with the chemical and allied trades at the end of 1949 was lower than in the previous year. Comparative figures of industrial distribution show a total of 20,150 (14,080 men, 6070 women) in 1949, compared with 20,330 (14,180 men, 6150 women) in 1948. In the treatment of non-metalliferous products other than coal, membership in 1949 was 31,990 (15,440 men, 16,550 women) as against 32,970 (15,860 men, 17,110 women) a year earlier.

Fewer fatal industrial accidents were recorded in October than in the previous month, the total of 117 comparing with a revised figure of 220 in August and 114 in October, 1949. In the chemicals, oils, soap, and allied industries deaths amounted to 10, which was four more than in September. Metal conversion and founding were next highest, with a total of eight. Clay, stone, cement, pottery and glass, also paper, printing, etc., accounted for two each, and gas works for one.

Cases of Poisoning

No deaths were recorded in the U.K. in October under the Factories Act, 1937, or under the Lead Paint (Protection against Poisoning) Act, 1926. Total cases reported were 43, as follows: Lead poisoning, five; mercurial poisoning, one; anthrax, three; epitheliomatous ulceration (skin cancer) 20 (pitch, seven; tar, 12; oil, one); chrome ulceration, 14 (manufacture of bichromates, three; chromium plating, 11).

The use of siliceous parting powders in foundries was the subject of new regulations made by the Minister of Labour and National Service, entitled "The Foundries (Parting Materials) Special Regulations, 1950," which came into operation on December 1.

The regulations, which are in technical terms carefully framed in consultation with industry, prohibit the use as parting powders, in connection with the making of metal castings, of certain materials which involve substantial risk of silicosis to the workers. These materials are (*a*) materials containing compounds of silicon calculated as silica to the extent of more than 3 per cent by weight of the dry material, and (*b*) dust or other matter deposited from a fettling or blasting process.

The prohibition does not extend to natural sand or to six substances specified in the schedule to the regulations if (in either case) the material does not contain an admixture of any other silica. The excepted substances are: zirconium silicate (zircon); calcined china clay; calcined aluminous fireclay; sillimanite; calcined or fused alumina; and olivine.

Copies of the regulations (*S.I.* 1950 *No.* 1700) can be purchased from H.M. Stationery Office, price 1d. net (2d. post paid).

Nylon from Seaweed

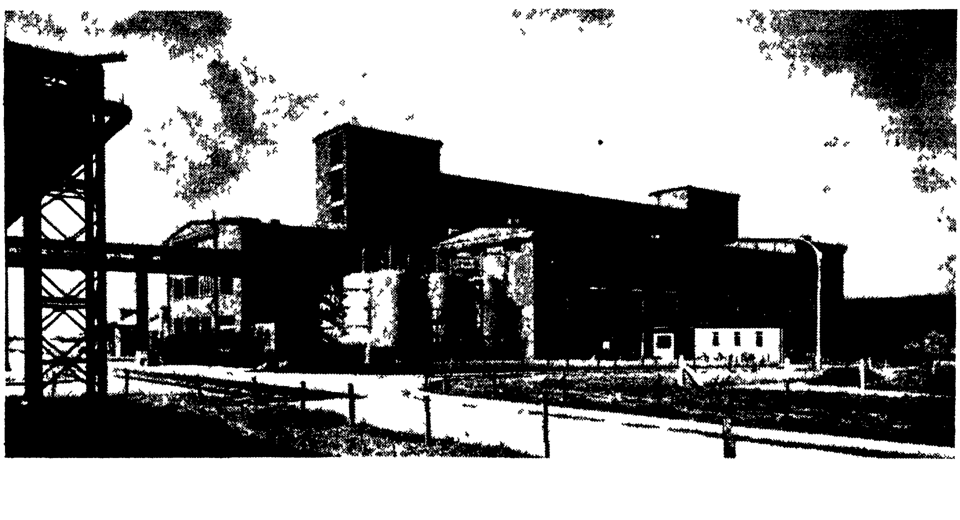
Mr. James Dillon, Minister for Agriculture in the Republic of Ireland, stated on December 9 that he was having plans examined to make nylon from seaweed and newsprint from peat.

PROGRESS AT WILTON

THE satisfactory advance that has been made on the 2000-acre site now being developed by Imperial Chemical Industries, Ltd., at Wilton, North Yorkshire, is shown in these photographs. They are the first official pictures taken since the £22 million scheme was inaugurated by the chairman, Lord McGowan in September, 1949, when he described it as "the greatest single project in British chemical history."

Some 3500 workers are at present employed on the site, 3000 on constructional work and the remainder in manning plant already in operation.

Part of the plant for the manufacture of olefines which have a marked chemical activity, is seen on the left with two circular vessels for the storage of gas under pressure in the background. Below: An exterior view of the PF resin and powder plant

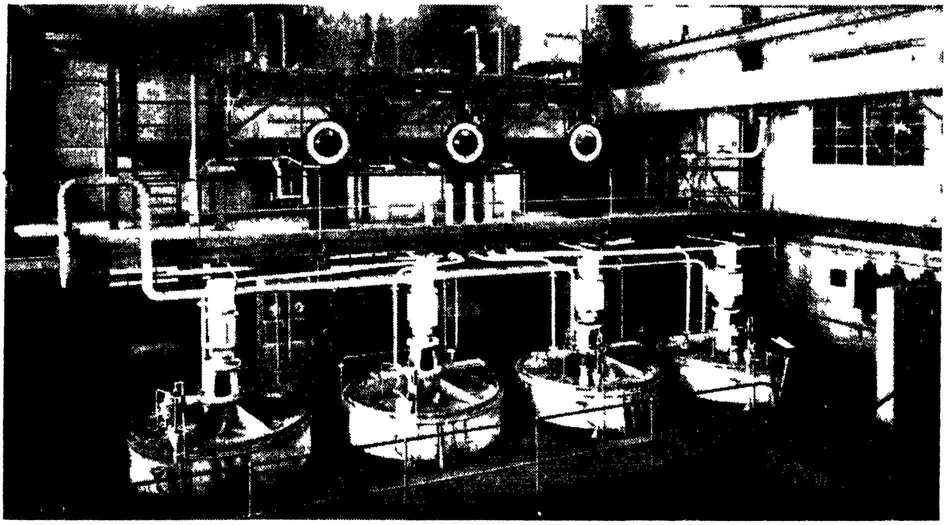


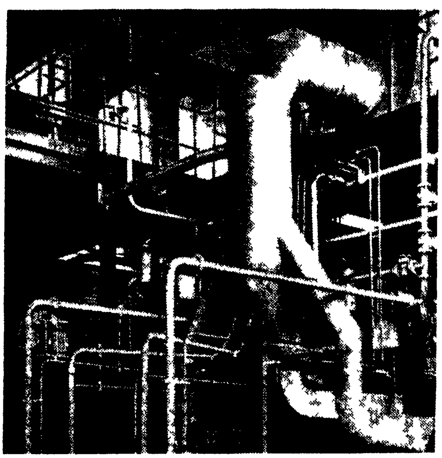
This giant group of chemical installations will yield many new or uncommon chemical materials The first two divisional plants to come into operation were those of the Plastic division for the manufacture of phenol-formaldehyde (PF) and Perspex acrylic resin for which there is an increasing demand at home and overseas.

Other installations in the course of construction include a petroleum cracker which will produce ethylene, methane-hydrogen, propylene and butane from crude oil

The Wilton site and its services will be available to any of I C I 's 11 manufacturing divisions that require them for new factories.

Interior view of the Perspex sheet plant





Two interior views of the phenol-formaldehyde resin plant. In the picture above can be seen the supply tanks containing formaldehyde, aqueous phenol and cresol

Completion of the Wilton scheme which was first announced nearly five years ago will enable fresh investigations to be carried out but it should also be remembered that it stands as a concrete example of the results of intensive research on which I C I spend £4 million a year.

This site will also be used to locate the first plant to make the new synthetic fibre Terylene on a commercial scale.

NULL BALANCE MEASUREMENTS

A Self-Balancing Recorder for Industrial Use

IT has long been claimed that where electrical measurements having a high degree of accuracy are required, a null balance measuring system is superior to methods employing deflecting instruments. Only in recent years has it been possible to apply this principle to industrial instrumentation, as conventional potentiometers and bridges previously available were suitable only for spot readings by a trained operator.

With the introduction of mechanically self-balancing instruments it became possible to make null balance measurements under industrial conditions and to record these measurements on a continuously driven chart.

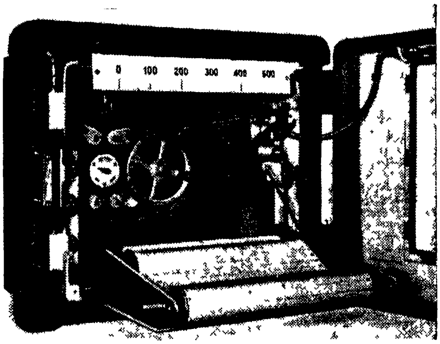
Latest Technique

The self-balancing recorder developed by the Metropolitan-Vickers Electrical Co., Ltd., employs the latest technique in this field, being a continuously self-balancing instrument using electronic power amplification and a motor drive. This principle not only gives a true continuous record of a rapidly changing variable, but eliminates the sensitive galvonometer and complicated feeler mechanism associated with earlier instruments.

Extreme reliability is thereby obtained, and the design lends itself to the construction of apparatus required for use under arduous industrial conditions. Ample power is available at the main shaft to operate alarm contacts or an automatic controller, and the high speed and sensitivity make it suitable for automatic control work where lags and "dead time" must be minimised.

For recording temperature from a thermocouple the instrument is arranged as a d.c. potentiometer. A fixed voltage is maintained across a slidewire by means of a rheostat and an air-depolarised dry battery which has a long life (about 12 months continuous running).

Every 15 minutes this voltage is balanced automatically against a standard cell and readjusted if necessary by means of a motor-driven rheostat. The millivolt output from the thermocouple is compared with the voltage across the slidewire, and the difference voltage is amplified and used to drive the potentiometer to balance, at the same time driving the pointer and recording pen to the correct position corresponding to the input millivolts.



[By courtesy of Metropolitan Vickers Electrical Co., Ltd.

The instrument records on a strip chart 10 in. wide. The roll chart is 120 ft. long and is driven by a self-starting synchronous motor through a six-speed gear box. A chart speed of one, two or three inches per hour or per minute can be selected. The chart drive assembly is shown lowered for changing

In order to use a stable a.c. amplifier, the uni-directional difference voltage is converted into a mains frequency alternating voltage before amplification. This is done by a special vibrator type converter of proved stability.

The instrument is rapid in operation, traversing the ten-inch scale width in two seconds with no overshoot. An accuracy of $\pm \frac{1}{4}$ per cent of full scale is claimed for all ranges above 1 mV, and the accuracy is unaffected by reasonable changes in supply voltage and frequency or ambient temperature.

High Sensitivity

When used in conjunction with a thermocouple, automatic compensation for cold junction temperature changes is provided. The d.c. potentiometer can be used for recording any variable that can be converted into a uni-directional voltage. The extremely high sensitivity of the instrument enables it to respond to input signals of less that one microvolt, the minimum full scale range being 500 microvolts. The maximum permissible input-circuit impedance is about 100 ohms for a range of 1 mV, but this impedance can be increased on higher ranges.

BRITISH CHEMICAL STANDARDS

THE increased demand for British Chemical Standards, both at home and abroad, was stressed by Mr. P. D. Risdale in a report given at a meeting held by the Bureau of Analysed Samples, Ltd., at York on 28 November.

Supplementing Mr. P. D. Risdale's remarks, Mr. N. D. Risdale gave a brief historical account of the standards movement and an outline of progress made in the last 12 years.

In July 1938 (he said) there were 41 standard samples available, representing about 200 standardised elements or constituents. This year 68 standardised samples are available, including eight pure metals or reagents and eight spectrographic standards. These represent something like 350 standardised elements or constituents.

In order to get the maximum homogeneity, we now aim at getting thin curly machinings which remain on a 60 mesh sieve and pass through a 10 mesh. There are approximately 300 particles per gram of steel, apart from some of the smaller material between 30 and 60 mesh.

We continue to take precautions to remove moisture and, in some cases, oxygen from the containers in which we store the machined steel—especially that which is required for determining sulphur by the evolution process. The same precautions are observed for crushed ferro-alloys.

During 1938, and again in 1947, he had visited the National Bureau of Standards, Washington, U.S.A. Generally speaking, their system was very similar to ours.

Common Applications

Many are familiar (Mr. Risdale continued) with the common applications of the standard samples. They are used mainly for checking routine analyses by making concurrent determinations of the standard sample with a batch of routine samples. They are also used for making similar checks on specific samples which have compositions bordering on a particular specification, such as sulphur in the region of 0.050 per cent. Another use is for checking new methods of analysis. These frequently appear in the technical periodicals, and often include a number of tests made on BCS samples as evidence of the accuracy of the methods in question.

A more recent use is for the preparation of graphs for photometric methods, especially since it has been possible to have standards which show progressive increments of different elements in ascending order, such as Si, Mn, Cr, Ni, Mo, etc. This is particularly useful in the case of Si. The preparation of a standard soluble silicate solution is not very easy and it is also difficult to preserve the alkaline solution, which attacks glassware.

Some more recent methods, such as the combustion sulphur procedure, are absolutely dependent upon chemical standards. Similarly, spectrographic standards are completely dependent on the accuracy of the chemical analysis of the standard rods.

1200 Using Standards

There are about 1200 laboratories using these standards in Great Britain including the Admiralty, Air Ministry and Ministry of Supply; universities, technical colleges, independent analysts, chemical manufacturers, engineers, founders, as well as hundreds of works chemists in the iron and steel industry.

Speaking in general terms the accuracy of analyses made in connection with the standardisation has improved considerably during the last 12 years. It is interesting to note, however, that although the "spread" of the figures which were accepted some years ago has recently been narrowed down, in most cases the general average figures have altered very little whenever re-analysis has been made.

In certain cases, such as the determination of silicon in cast iron, it has been found that a second evaporation does precipitate a small but significant amount of silicon, thus giving a result which is 1 or 2 per cent higher (of the Si content). A sample of red oxide iron ore analysed in 1925 showed an iron content of 58.2 per cent. The same sample remixed and re-analysed by the latest recommended methods by about a dozen experienced chemists showed 58.1 per cent. This is remarkably good agreement.

A basic slag sample, however, also analysed in 1925 showing an iron content of 8.93 per cent, was re-analysed by the same group of chemists this year. They found 8.75 per cent by the hydrogen sulphide reduction method, which is not interfered with by the presence of vanadium in the slag.

The use of British Standard methods by the co-operating analysts during more recent years has led to better agreement and this is well illustrated in the analysis of the permanent magnet alloy standard (B.C.S, No. 233).

An interesting case which occurred recently was concerned with analytical

tolerances and British Chemical Standards. The plaintiffs had bought some phosphor bronze to a stringent specification of a maximum of 0.01 per cent. The sample of the parcel had been sub-divided and sent to several analysts whose results varied appreciably.

The certificate of analyses of our B.C.S. Bronze "C" (No. 207) had been scrutinised by the defendants and it was noticed that the phosphorus content which averaged 0.055 per cent showed a range of figures varying plus or minus 0.01 per cent It was therefore explained that, with such a fine specification, a tolerance in the figures reported should bear some relationship to the tolerance shown on the B.C.S. certificate, where chemists had reported results after carefully verifying their figures. At first it was difficult for the layman to appreciate that any tolerance should be allowed, but the impartial evidence of the certificate undoubtedly impressed the judge and no doubt contributed to the defendants winning their case.

Literally hundreds of thousands of tons of steel made in this country and in Australia, South Africa, etc., have had the chemical control assisted by the regular use of British Chemical Standards—a substantial contribution to manufacturers and production.

Precise Assessment Difficult

It is difficult to assess precisely how many disputes on analysis have been avoided or settled by the use of B.C.S. but the number is certainly large. I recall that in my earlier days steel works sometimes had the analysis of their steels checked by outside independent umpires, who in some instances have very little experience in such analyses. Consequently, the results were occasionally very unfortunate. Large casts of steel were sometimes rejected and there were many heart burnings. If there had then been authoritative standard samples such as are now available, the works chemists and the management would have regarded them as priceless.

The last twelve years has been a period of steady progress during which some 27 new standard samples have been prepared and made available. In addition, a considerable number of existing standards have been renewed. The quality of the product and the agreement between chemists have likewise improved.

If I were asked what is the most important contribution these standards have made in their own field, I would say that it is that they have brought chemists all over the country into more intimate and friendly contact with one another, given them a much better knowledge of the standard of accuracy of their own work and of the methods of analysis they have been using—and most important of all—promoted a great deal of good will.

EFFLUENTS AND DETERGENTS

REFUSAL of the West Riding sewage works authorities to accept from the wool industry effluents containing synthetic detergents was commented on by Mr. W. L. Thomas, chief chemist of Woolcombers, Ltd., in an address to the Yorkshire section of the Textile Institute and the Bradford Textile Society in Bradford on 5 December.

The use of synthetic detergents in wool-scouring was now an economic proposition, for they were cheaper than soap, but bulk working, although desirable, was held up by reason of the effluent treatment problem, on which more information was urgently needed.

Objections by sewage works authorities appeared to be the result of laboratory or small-scale experiments, which indicated trouble in the biological processes of sewage treatment rather than any real difficulties. Despite the large quantities of synthetic detergents being used for domestic purposes and in laundries these did not appear to be creating insuperable difficulties in the way of sewage works generally.

The difficulties of sewage works managers and engineers in running such large undertakings as those at Bradford, Huddersfield and Halifax to public health standards were understood. With the willing assistance of the makers and users of the detergents, however, Mr. Thomas suggested that treatment could undoubtedly be modified to overcome the difficulty, for it was an impossible position that a scientific discovery of such magnitude should be permanently held up by a sewage works problem.

Referring to wool oiling—a matter of great general importance at the present time—the speaker expressed the opinion that there appeared to be no advantage to be gained by returning to the use of olive oil because of the unsatisfactory nature of the olive oil market, with its wide fluctuations in price and the fact that the source of supply was outside the Commonwealth.

FEATURES OF HARWELL'S GLEEP

First Comprehensive Report from Harwell

GLEEP, the Graphite Low Energy Experimental Pile at the Atomic Energy Research Establishment, Harwell, began operating in August, 1947. Essential features of the reactor and an account of some of the experimental work carried out is contained in the first comprehensive report which has now been released under the recent declassification of atomic information agreed upon between Britain, Canada, and the U.S.A. (THE CHEMICAL AGE, *63*, 770).

The Gleep is a slow neutron reactor using graphite as a moderator and natural uranium and uranium dioxide as fissile material. It was constructed to meet two main requirements. First, to run at as high a power as possible without elaborate cooling arrangements. This high power was needed so that radioactive isotopes could be produced until such time as the larger Harwell pile (Bepo) became divergent. Second, to compare slow neutron absorption cross-sections of the elements bv the pile modulaton method.

As a later development it was found that Gleep could be used to provide an accurately known and reproducible thermal neutron flux in the range 16^6 to 10^8 n/cm^2/sec. This flux can now be used to determine activation cross-sections.

The pile is built in the form of a right octagonal prism of graphite lying on one of its sides. The reacting core is cylindrical (length 5.24 m., radius 2.86 m.) with the uranium rods lying horizontally in the form of a line lattice of pitch 7¼ in.; the reflector forms the remainder of the octagon, the lower corners of which are filled in with graphite introduced for constructional reasons only.

Graphite Layers

Total quantity of graphite in the pile is 505 long tons. This is stacked in 40 layers, each of which is constructed of graphite blocks stacked in such a manner as to resemble a parquet floor. These blocks are of two standard types each measuring 7¼ in. by 7¼ in. by 29 in. Various non-standard and half blocks are incorporated, but leading dimensions of all blocks are based upon the fundamental "pitch" unit of 7¼ in. The edges of some blocks are chamfered, and grooves are cut in other blocks, so that a lattice of diamond shaped holes of 1.85 in. side runs through the pile from A (north) to B (south).

The reacting core is loaded with uranium metal up to a radius of 1.75 m., the outer region being loaded with uranium dioxide. The uranium metal is in the form of cylindrical bars 12 in. long by 0.9 in. diameter, and is sprayed with aluminium of 0.008 in. thickness to prevent the escape of recoil fission products.

In order to increase its density, the uranium dioxide is pressed into pellets 1.60 in. in diameter and 2 in. long. These pellets are wrapped in paper containers and inserted in batches of six into aluminium cans of 0.01 in. thickness. This makes a uranium dioxide cartridge 12 in. long by 1.62 in. diameter, weighing 2.6 kg. In all, the Gleep contains 12 tons of uranium dioxide.

Access to the Interior

There is a 8 ft. air space between the sides of the graphite structure and the inside of the biological shield. This allows access to the inside of the pile if the necessity arises for the removal of any of the uranium cartridges. The concrete biological shield is of 5 ft. thickness around the sides and is 4 ft. thick on the top.

On the B face of the pile there is a hole in the shield which is filled by graphite blocks to form a square section thermal column of 5 ft. wide and 7 ft. long. On the top of the pile is a large access hole so that an additional thermal column can be stacked there if it is required.

An elementary ventilation system capable of delivering 5000 c.f.m. of air is provided to remove active argon from the pile, and to provide some cooling of the uranium cartridges. The air is forced by the baffle on A face to flow over the uranium cartridges and is extracted by a suction fan on the top of the pile.

When the air system is on, it is arranged that the pressure inside the pile is always less than atmospheric; this ensures that there is no leak of radioactive air into the building. The air is ejected through a short stack on the roof of the building (the top of the stack is 60 ft. above ground level) and when the air has diffused to ground level outside the building, its activity is below the tolerance level. By using the air cooling system, the pile can be run at a power of 100 kW.

When all absorbers are removed from the pile the Gleep has an excess effective reproduction constant of 2×10^{-3}. This

excess k is controlled by four cadmium rods which move together. These four rods are known as the coarse control; there is a single rod for fine control. All the control rods can be moved up and down by electric motors which are situated on the outside of the pile and operated from the pile control room.

Emergency Control

In addition, there are two sets (each consisting of three rods) of emergency shut down rods. These cadmium rods are held right out of the pile when it is operating, by magnetic clutches. If the pile power rises above a pre-set level, a trip circuit cuts off the current to the magnetic clutches, and the emergency rods fall into the pile under gravity. On the end of a shut-down rod shaft is a disc keyed to the shaft and positioned to rotate between the poles of four electro-magnets to form an electric brake. As the rods approach the "fully in" position, the magnets of the brake are energised, and the rod motion is retarded to a gentle halt.

To indicate the position of the control rods in the pile, two transmitter magslips driven through gearing so that one rotates fifty times as fast as the other, are mounted near the drive motors. These transmitters are electrically connected to receivers in the control room, so that direct readings of the positions of the rods are given on two dials. By this means the position of the rods can be read with an accuracy of ± 1 mm.

Ionisation Chambers

The power level of the pile is measured by six ionisation chambers of 5 litres volume, containing boron trifluoride gas at a pressure of 20.7 cm.Hg. Three of these chambers are used for pile control, and the other three are used to operate the emergency shut down mechanism. All the chambers have pre-amplifiers attached to them, the main amplifiers being in the pile control room.

Initially, as the pile power is raised from zero, the resistor in series with a chamber is changed, so that the chamber measures all powers up to 1 kW without any change of position. (The resistor can be changed by operating a wafer switch outside the pile.)

Above 1 kW the chamber is wound out of the pile successively to two preset positions, in which the neutron fluxes are factors of 10 and 100 times lower than the flux at the original position.

In this way, with only three positions for each chamber, six decades of pile power can be measured. There are eight ionisation chamber holes in the pile. The two additional holes are used for experimental work; one of them is used permanently for work with the Gleep oscillator.

Rough temperature measurements are made at four points in the pile by means of resistance thermometers. Two of these thermometers are strapped on to uranium cartridges near the centre of the pile, one is embedded in a uranium dioxide cartridge, and the remaining one is embedded in a graphite cylinder which has been lowered down one of the vertical experimental holes. The temperatures are recorded continuously in the control room, and it is arranged that if the temperature of the uranium metal cartridges exceeds 60° C., the pile is automatically shut down.

Experimental Holes

Gleep has only seven experimental holes, so details of all of them are given below:

(a) Hole J_1, running from face A to face C through the centre of the pile, 3 in. diameter. Since this hole is along the axis of the pile, and therefore parallel to the uranium holes, it is used for pile oscillator work.

(b) Hole J, running from face B to face D through the centre of the pile and thermal column, 3 in. diameter.

(c) Hole K, to one side of the thermal column, running from face B to face D, 5 in. by 4 in. The maximum slow neutron flux in this hole at 100 kW is 3.0×10^{10} n/cm^2/sec, and this hole was used for the manufacture of radio-isotopes when Gleep first began operating.

(d) Hole Lγ, to one side of the thermal column, running from face B to face D, 8 in. by 8 in. This hole can be used for testing the effect on the reproduction constant of the pile of inserting large quantities of material.

(e) Hole W, running from top to bottom of the pile through the centre, 3 in. diameter.

(f) Holes X and Y, running from top to bottom either side of hole W, 4½ in. diameter.

Although in the foregoing list, holes J_1, J and W are all stated to pass through the centre of the pile, they are in fact offset from each other by half of a lattice pitch.

Soon after Gleep started operating, the pile control rods were calibrated so that the amount of k they took up when in a given position in the pile was known. This was done by first of all balancing the

pile with the control rods so that it was running steadily at low power, then withdrawing the control rods a measured amount, at the same time observing the rate of rise of pile power. From a knowledge of the number of delayed neutron emitters, the half lives of these emitters and the rate of rise of pile power, it is possible to calculate the change which has been made in the effective reproduction constant.

Also shortly after starting up, a run was made at 100 kW without the air cooling system on. As the temperature of the pile rose, the control rods had to be withdrawn in order to keep the power at 100 kW. From the calibration of the control rods and the measured temperature rise, the temperature coefficient of the pile was deduced.

The temperature coefficient depends on the temperature distribution in the pile, but for a pile running without any cooling, the temperature is, of course, highest at the centre and falls off towards the edges in much the same way as the thermal neutron flux does.

For such a temperature distribution, and for the same change in the graphite temperature as in the uranium temperature at the centre of the pile, change in effective reproduction constant is: $-2.9 \times 10^{-5}/°$ C.

It should be noted that the pile has a negative temperature coefficient, and that this prevents the pile from rising to a very high temperature if, for example, the control system were to fail. In fact, since the excess k of Gleep is only 2×10^{-3}, a temperature coefficient of $2.9 \times 10^{-5}/°$ C. means that the Gleep could ony rise 70° C. in temperature before all the excess k disappeared.

Pressure Coefficient

Pressure coefficient of the pile was measured in the following way. The pile was run steadily at low power for about half an hour, and then the control rods were set in position. Next, with all the holes in the pile shield closed as well as possible, the extractor fan was switched on. This put the pile under 3.5 cm. of water suction (the mean value as recorded by a manometer on either side of the pile), and the rise in pile power was observed for fifteen minutes.

From the rate of rise of pile power the pressure coefficient was calculated, and the answer obtained was: Change in effective reproduction constant is: -6.5×10^{-6}/mb. This coefficient is also negative, since an increase in atmospheric pressure increases the amount of nitrogen in the pile and reduces its reactivity.

In order to check that no dangerous amount of activity was escaping from the stack at high power running, a 20 atmosphere Argon chamber was installed in the top of the stack to measure the gamma reactivity of the effluent from the pile.

During the initial runs at high power, it was noticed that not only did this chamber give a higher current than would be expected from the Argon 41 activity, but also that this activity built up with time when working at a constant power level. This suggested that fission product activity was escaping from the uranium in the pile and the following experiments confirmed this.

Background Counting Rate

An aluminium tube was placed through the J hole of the pile. Arrangements were made to flow air through this tube and then over a Geiger-Müller counter. With the pile running at constant power, a given flow of air was passed through the system and the background counting rate due to the Argon 41 was determined.

A small foil of bare uranium of known area was then put into the centre of the tube and the counting rate due to the fission products carried off from the foil obtained. This bare foil was then replaced, firstly by samples of the aluminium sprayed uranium rod, and secondly by a uranium dioxide cartridge. The results of this comparison of bare uranium with the two types of cartridge used in the pile showed that whereas the aluminium spraying was 99.5 per cent efficient, the uranium dioxide cartridges were leaking gaseous fission products into the air stream at a very high rate.

In view of these results the channels of the pile containing the uranium dioxide cartridges were blocked off from the airstream. Since they form the outside ring of the pile where the neutron flux (and therefore the heat output) is low compared with the central channels, this did not in fact make the oxide cartridges rise appreciably in temperature when running at 100 kW.

The discharge of fission products with the associated build up activity on the stack monitor was reduced by a factor of ten.

Most of the experiments described in this section were done with the Gleep oscillator.

Parliamentary Topics

FERTILISER prices were the subject of questions in the House of Commons last week, when Mr. T. Williams, Minister of Agriculture, said that it was appreciated the rise in price had caused difficulties to some farmers. Removal of the subsidy, however, had been taken into account when prices were fixed last February, and there was little chance of the general subsidy being restored. Grants in respect of fertilisers for grassland did, in fact, bring the cost of these to below 1949 level. Mr. R T. Paget asked that some credit arrangement might be made to enable farmers to spread the cost of fertilisers over the period in which they would get a return, but the Minister replied that he was not at all sure that this was necessary.

* * *

MEASURES to alleviate the shortage of some metals were being discussed internationally, stated Mr. G. R. Strauss, Minister of Supply, in a written answer. Restrictions of consumption, in some cases substantial both in amount and in their effect on industry, were already in force. Supplies of zinc to consumers were cut early in October to a rate equal to 75 per cent of consumption during the first nine months of 1950. Supplies of aluminium to consumers were limited to an amount well below current demand and nickel has been rationed by the suppliers among their customers to nine-tenths of what they had in 1949 and early 1950. Supplies of steel sheet and tinplate have been much below requirements and subject to strict allocation since the end of the war.

Fair Distribution

The Government had now decided to take further steps to ensure the proper distribution in the national interest of those metals where a severe shortage persisted. The measures under consideration in consultation with industry included restrictions on the export of semi-manufactures, the prohibition of the end uses of these metals for inessential articles, and the institution of allocation systems.

Meanwhile, the supply prospects for the metals which were at present causing most concern were as follows:—

Zinc.—Supplies of all grades of zinc available to industry over 1951 as a whole would, so far as could be seen at present, involve further cuts in consumption and out of the amount available the increasing requirements of defence would have to be met. During the first quarter of the year the position was likely to be even more serious owing to a particularly acute shortage of the ordinary grade which was used mainly for galvanising and for making brass and zinc oxide. Though every effort was being made to avoid it, the supply of this grade may have to be restricted during that quarter to little more than 50 per cent of the rate of consumption during the first nine months of 1950.

Copper.—A severe shortage of certain special shapes would affect particular fabricators, unless they were in a position to substitute the normal shapes in their processes. For the rest, the prospects for copper in the early months of 1951 were that supplies would not allow of consumption at a higher rate than in the first half of 1950, which represented a cut of about 10 per cent on the current rate of consumption and an even greater cut on normal civilian consumption as the requirements for defence progressively increased.

Aluminium.—So far as could be seen at present, supplies of virgin aluminium which have been running at about 17,000 tons a month, would have to be restricted in 1951 to 15,000 tons a month, out of which the substantially increasing demand for defence would have to be met.

Nickel.—There did not appear to be any prospect of an increase in supplies above the present level in spite of the growing demand for defence purposes.

Steel.—There was at present no real shortage of general steel but steel producin 1951 might be affected by difficulties in supplies of steel making raw materials, particularly imported scrap (mainly from Germany) and imported iron ore. It was hoped that these difficulties might be overcome but if not it seemed possible that the 1950 level of steel output might not be achieved in 1951. No improvement in supplies of steel sheet or tinplate could be expected until the new plant in South Wales came into production in the latter part of 1951.

It was obvious that if shortages of non-ferrous metals of the kind continued throughout 1951, they could not but impose a serious check upon the rising output of the engineering industries on which we were so heavily dependent not only for our rearmament programme but also for a large part of our export trade and for essential investment at home.

Steps would, of course, be taken to ensure that these metals were available for rearmament.

MR. FREDERICK PEEL

It is with the greatest regret that we announce that MR. FREDERICK PEEL died suddenly at his home at Upminster on Wednesday, 6 December, in his 64th year.

Mr. Peel was born on January 21, 1887, and received his technical education at the Marine School, South Shields, and Sunderland Technical College. He served an apprenticeship of six years in the Mercantile Marine, rising to chief engineer. He then served three years in the shipbuilding and engineering shops of John Readhead & Sons, South Shields, and was Premier Silver Medallist in Mechanical Engineering, City and Guilds Institute, Premier Prizeman of Goldsmiths Institute, and National Prizeman in Machine Design, Board of Education. He obtained the Extra First Class Engineers Certificate under the Board of Trade.

For three years he was with Messrs. John I. Thornycroft & Co., Ltd., and Messrs. Job Bros., Liverpool, engaged on the design, construction, testing, and installation of large two-cycle marine diesel engines at a time when this was work of a very pioneering nature.

In 1913 he began to work with W. J. Fraser & Co., Ltd., at Dagenham, on the design and construction of a revolutionary type of two-cycle diesel engine, the main features of which have become standard practice in marine engines of this class. Work on this was suspended because of war conditions in 1915, when Mr. Peel became chief draughtsman and subsequently chief engineer of W. J. Fraser & Co., Ltd.

He took up the study of chemical engineering and the design of chemical equipment in a very energetic manner and was associated with many advances in acid, fertilizer, mineral oil and many other types of chemical plant. He was appointed a director of the company in 1938.

During the last few years. Mr. Peel devoted a large proportion of his spare time to work on the preparation of the Standard Code of Practice for the Design and Construction of Pressure Vessels for the British Standards Institution, this work culminating in the issue of B.S. 1500 and its accompanying material specifications. He was a member of the Main Committee on Pressure Vessels and of all its panels and he personally drafted many sections of the Code.

Mr. Peel was one of the earliest members of the Institution of Chemical Engineers and was a member of the Institute of Marine Engineers.

Harrison Memorial Prize

The Harrison Memorial Prize for 1950 is to be awarded to Dr. Hugh Christopher Longuet-Higgins. The presentation of the prize will be made during the anniversary meetings of the Chemical Society to be held in London on 20 and 21 March, 1951. This decision was reached at a meeting of the Selection Committee held on 7 December.

Dr. Longuet-Higgins was educated at Winchester and at Balliol College, Oxford, where he was an Open Scholar. He was awarded first-class honours in the final honour school of natural science (chemistry) in 1945. During the years 1945-8 he worked under Dr. (now Professor) C. A. Coulson. In 1946 he was elected to a junior research fellowship at Balliol College, but relinquished this in 1948 to become a research associate of the University of Chicago, where he carried out experimental and theoretical work with Professor R. S. Mulliken and Dr. W. C. Price. In 1949 he returned to become lecturer in theoretical chemistry at the University of Manchester.

The Harrison Memorial Prize may be awarded for outstanding merit in any branch of pure or applied chemistry. It was created in 1922 to commemorate the devoted services of the late Colonel E. F. Harrison, formerly deputy controller of the chemical warfare department, for the protection of the British forces from poison gas in the 1914-1918 War. It is awarded to the British chemist, under 30 years of age, who, during the previous five years has published the most meritorious and promising original investigations in chemistry.

Atom Scientists Meet

MORE than 200 nuclear scientists from Great Britain, the U.S.A., Europe and India are now meeting in Bombay. The occasion is the International Conference on Elementary Particles, which will last until December 21. The scientists will discuss, among other things, cosmic rays and the meson, and will also review recent experimental evidence for the interactions and transformations of fundamental particles, as postulated by theoretical and mathematical description. The conference will be inaugurated by Professor Niels Bohr.

POWDER METALLURGY

IN a recent lecture to members of the American Society of Metals, Dr. Henry H. Hausner said that powder metallurgy methods for research included four basic applications of the relatively new technique which might be defined as: (1) for investigations which exclude molten stage of the metal, (2) when interruptions are required to investigate certain stages of the process, (3) when statistical observations are desired, and (4) when high pressures between small surfaces are used for investigations.

The development of powder metallurgy techniques was greatly accelerated in industry during World War II, he said, when it was urgent to produce metal parts with maximum speed, a minimum of manpower and, in many instances, with special materials. Powder metallurgy was the technique for production of solid metal parts from metal powders by compacting and sintering below the melting point of the metal. This method could be applied to production of parts made of one metal or made of alloys.

Tracing the development of powder metallurgy from its first commercial application Dr. Hausner said it reached back to the work of Auer von Welsbach who used a similar technique for the development of cerium wire for incandescent lamps in 1897. Dr. Coolidge, of General Electric, applied the technique to produce the first ductile tungsten wire for incandescent lamp filaments in 1909, and the rapid progress since that time in both lamp and radio tube development was closely connected with powder metallurgy production of tungsten and molybdenum.

Used for Making Contacts

Powder metallurgy methods were also widely used in the production of electrical contacts which must not weld or stick during operation, should be hard and not pit and should have good electrical and heat conductivity. Powder metallurgy permitted compounding metals which tend to combine the good conductivity of the silver-copper group with other desirable characteristics of the tungsten-molybdenum group.

Applications where the physical properties of products resulting from powder metallurgy techniques were important, included a wide range of items such as metallic filters and porous or oil-impregnated bearings and bushings, not necessarily of small dimensions. The Chrysler Corporation, General Motors, Ford and other automobile manufacturers were large consumers of powder metallurgy parts including those for windshields, generators, heat blowers, valve guides, shock absorbers, oil pump rotors and many others.

During the last few years, another application of powder metallurgy methods had been developed. Experience and theoretical considerations had shown that powder metallurgy could be usefully applied for research in general physical metallurgy, in the study of phenomena such as nucleation, recrystallisation, grain growth, diffusion and homogenisation. Powder metallurgy of today was a research tool, the usefulness of which could hardly be over-rated.

Sulphuric Acid Production

REDUCTION of imports of sulphur from the U.S.A. could be faced with fortitude stated Mr. F. A. Perkins, chairman and managing director of the Lawes Chemical Company, in his address to the 78th annual general meeting in London on 5 December, as some two years ago the erection had been approved of a plant to produce sulphuric acid from sulphur bearing materials other than those from American sources.

Progress payments on the acid plant at 30 June, amounted to £74,000, and although some delays inherent in a scheme of construction had been experienced, progress was sufficiently satisfactory for some advantage to be gained during the current season.

Demand for granular compounds had risen, continued the chairman. An increase in stock reserves made in May and June might have some effect upon the 1950-51 season, but once the sulphuric acid plant came into operation, greater production would be possible.

The company's Articles of Association which were nearly 50 years old had been brought up to date to comply with the Companies Act, 1948.

Considerable attention has been drawn recently to productivity of British industry. It was satisfactory to note, therefore, that in the Anglo-American Productivity report British granular plants had produced figures comparable with the best American practice. Compound fertiliser production in 1949-50 was approximately three times that of 1939-40. This company had played its full part in this increase.

The necessity to expand production of food at home was recognised by the Government and fertilisers were essential to this end for any programme. Close co-operation with Government departments had been maintained.

SULPHUR — THE AMERICAN PICTURE

From a Correspondent

The sudden crisis in sulphur supplies and its consequent effects upon sulphuric acid output have been discussed in recent issues of THE CHEMICAL AGE, *particularly in the issues dated October 21 (pp. 557-558) and December 2 (p. 767). The following article, based upon American information, is particularly relevant as almost all Britain's sulphur requirements were until recently imported from the United States.*

THE standard text-books used by many present-day chemists when they were being trained laid the main emphasis upon Italy, and particularly Sicily, as the world's principal source of elemental sulphur. The fact that almost the whole of Britain's sulphur needs since the war have been imported from America has surprised some chemists whose only contact with this element is with the sulphuric acid made from it. The virtual cessation of sulphur exports from the U.S. has led to a crisis for the British chemical industry, the seriousness of which would be hard to exaggerate. The production of materials for which large quantities of sulphuric acid are required has been curtailed, *e.g.*, superphosphate. The prices of innumerable chemicals whose manufacture requires sulphuric acid will have to rise.

The development of a large sulphur industry in the United States began just before the first world war. In the previous century much of the sulphur required for sulphuric acid manufacture was imported from Italy but from about 1890 onwards the high price required drove more and more of the U.S. acid manufacturers to the alternative method of pyrites burning.

War Requirements

In the first world war the total demand for acid rose so greatly that the use of sulphur returned and by the end of the war nearly half of America's sulphuric acid was being produced directly from sulphur. At the same time, however, a new process for extracting sulphur from salt domes in Louisiana had been developed by Herman Frasch; indeed, even as early as 1918 250,000 tons of sulphur were being produced from Louisiana compared with 400,000 tons from Sicily.

The Frasch process is simple and cheap. The sulphur deposits occur at depths of about 900 feet beneath clay, sand, and rock. Pipes are sunk through a bore-hole and super-heated steam is pumped down some pipes. This fuses the sulphur. Compressed air is pumped down other pipes and an aerated emulsion of molten sulphur rises to the surface through the remaining pipes. The emulsion solidifies on cooling in tanks and sulphur of high purity is immediately available.

The low costs of this process for extracting sulphur from natural deposits not only encouraged the American acid industry to develop sulphur-using rather than pyrites-burning plant, but it reduced the world price for sulphur, which had remained high so long as Italian deposits produced the dominant share of the world's total output of the element.

Competition

Competition brought lower prices and the tendency to base acid manufacture upon such materials as pyrites, native to many countries, was checked. In a recent American article[1] it was said that the Frasch process " restored brimstone sulphur to its premier position as the source of world sulphur in the manufacture of sulphuric acid."

By 1920-1924, 800,000 tons of sulphur per year were being extracted from salt domes in Louisiana. Today the annual rate of extraction is 5 million tons. Unhappily there is every sign that the contribution of the Frasch process to the world's sulphur needs will come to an end when it is between fifty and sixty years old.

In 1944 the remaining reserves were estimated by the Bureau of Mines and the U.S. Geological Survey to be 82 million tons. By the end of 1950, 25 million tons will have been extracted. The residue of 57 million tons will last only another 11 years at the present rate of mining, 5 million tons per year. Some authorities in the United States believe that the 1944 estimate was somewhat conservative but even their more optimistic verdict is that Louisiana and Texas salt domes cannot continue to yield sulphur longer than another 15 to 20 years.

The Frasch process, though cheap to operate, has severe limitations. The sulphur-containing salt domes of America lie on the Mexican Gulf coast between the Rio Grande Valley and Alabama. In all nearly 200 domes have been found but only 12 have been workable. The Frasch method can be applied only to domes that meet precise geophysical conditions. Also, the extraction method mines only a small area.

Even now when 5 million tons a year are being produced, only seven domes are being worked. The remaining five of the 12 in the history of this process have already been abandoned. One of the seven currently operated is said to yield two-thirds of the total sulphur produced, or about twice as much as the other domes together.

The Gulf Coast region has been thoroughly explored for both oil and sulphur and it is now felt that new deposits are unlikely to be discovered there. Domes are known to exist beneath the sea in the Gulf of Mexico, but the cost of underwater installation of the Frasch process would make sulphur extraction hopelessly uneconomic.

Exhaustion By 1970

Within the United States sulphur deposits minable by the low-cost Frasch method will be exhausted by 1970 at the latest and probably some years before. The only hope for any continuation of this process seems to lie in Mexico where a number of sulphur-containing salt domes have already been prospected.

These deposits are a long way from industrial centres and communications would have to pass through jungle areas but useful tonnages of sulphur are believed to be producible. No developments of any size have yet taken place.

With the post-Korean re-armament programme increasing the demand for many products requiring sulphur and acid, an appreciable number of dearer sulphur sources is certain to enter production. In the past the low price of Frasch sulphur has discouraged these alternative processes. Another effect that is already disturbingly realised in Britain is that America has decided to reduce sulphur exports drastically.

Sulphuric acid can be produced without using elementary sulphur. Indeed, pyrites and brimstone sulphur have been competitive raw materials for many years. The movement away from sulphur towards pyrites in America at the end of the last century began when Italian sulphur rose from 20 to 70 dollars per ton; it is not uninteresting to compare the recently advanced price to 22 dollars per ton. Making allowance for the reduced value of all currencies since the turn of the centuries, this comparison shows how greatly sulphur prices have been reduced by the Frasch process.

With a free choice, most acid manufacturers today would prefer to use elementary sulphur. The total cost of a pyrites roosting plant is 2½ times that of a sulphur burning plant. The labour and maintenance costs are much higher; total operating costs are said to be five times higher. One appreciable factor is that pyrites contains much less sulphur per ton; 40 per cent as against 98 per cent of the material burnt produces sulphur dioxide. The residual iron oxide is not an immediately valuable by-product; it must be further processed before it is suitable for the steel industry.

Nevertheless, even in America a steady return to pyrites as a source of sulphuric acid is now likely to develop. Known American reserves of iron pyrites are sufficient to last for 25 years and further deposits could almost certainly be discovered. For American users of acid this must mean appreciably dearer acid. It is unlikely, therefore, that opinion in America will favour a revival of substantial exporting of cheap sulphur to countries which formerly relied upon American sulphur. As the price of acid in America steadily rises the chances of reviving sulphur exports will become less and less.

There are a number of deposits of sulphur besides the salt dome deposits, but it is unlikely that these will produce cheap sulphur. Even with relatively cheap labour available the large Italian deposits have long failed to compete with Frasch-obtained sulphur. It is felt in America, therefore, that surface deposits in Texas, Utah, and California will be more costly providers of sulphur for acid than pyrites.

Still Plenty of Sulphur

This, then, is the background to the present situation. To talk of an approaching world shortage of sulphur is incorrect. There is plenty of sulphur—in pyrites deposits and in mineral sulphate deposits. Appreciable amounts of elementary sulphur are still left in the surface deposits of the world workable by normal mining methods.

What has happened is that the one source of low-cost sulphur has come within sight of eventual exhaustion; and the effects of this have been sharply accentuated by rearmament and an enlarged demand for sulphuric acid. All the alternative methods of making acid or producing sulphur are inevitably more costly; widespread increases in costs in the chemical industry would seem to be inescapable.

[1] V. Sauchelli, *Soil Science*, 1950, 70, 1, pp. 1–8.
[2] *Chemical Industries*, 1950, 67, 5, pp. 718–719.

TESTING VULCANISED RUBBER

STANDARDISED methods of analysis and tests for vulcanised rubber were first issued as B.S. 903 by the British Standards Institution, in 1940. A revision of that document has now been issued both for the purpose of providing methods for use in British Standards and to provide a set of reliable methods for use by all those concerned with the analysis and testing of vulcanised rubber.

It is pointed out that in addition to a great number of tests which are now in general use having been added to the original standard, the scope of the document has been widened to cover synthetic rubbers as well as natural rubber.

The standard does not include all the test procedures for which standardisation is desirable, because some require further investigation before reliable standard techniques can be recommended. In view, however, of the urgent need for a revision of B.S. 903, to meet the demands of rubber manufacturers and users, it has been thought best to defer inclusion of these still debatable procedures until they have been further studied.

The document has been drawn up in such a way that closely related methods are grouped into a self-contained document and are given a distinctive number.

The various methods of analysis and tests covered by the standard are as follows:—

Acetone extract, unsaponifiable matter in acetone extract, paraffin wax and ceresin, chloroform extract, alcoholic-potash extract, total sulphur, extractable sulphur, rubber-combined sulphur, sulphur in total fillers, sulphide sulphur, natural rubber hydrocarbon (direct determination), nitrogen (for acrylonitrile polymers), chlorine (for chloroprene polymers and copolymers), isobutene-diene (butyl rubber), thioplast rubbers, total fillers, ash, carbon black, antimony, copper manganese, carbonate, glue, cellulose, water extract.

Physical Testing Methods

Methods for physical testing for the following are included:—

Accelerated ageing, density and specific gravity, tension stress-strain, tension set, compression stress-strain, compression set, hardness, durometer indentation, creep and tress relaxation, rebound resilience, resistance to low temperature, abrasion resistance, tear strength, resistance to flex-cracking and cut-growth, swelling in liquids, equilibrium water vapour absorption, permeability and porosity to gases, permeability to liquids, ply separation (adhesion), electric strength, surface and volume resistivity, permittivity and power factor, and for ebonite, the following:—

Cross-breaking strength, impact strength, plastic yield, compression strength, linear coefficient of thermal expansion.

Sir John Cass College

AN interesting series of courses is announced by the Sir John Cass College for the second term of the 1950-51 session.

In the department of chemistry, ten lecture-demonstrations will be given by David W. Wilson, M.Sc. (Belfast), F.R.I.C., and Joy P. Stern, B.Sc., Ph.D. (London), D.I.C., A.R.C.S., A.R.I.C., on "Microchemical Analysis." The course is suitable for analysts and advanced students and is designed to introduce the principles and technique of inorganic and organic analysis on the micro and semi-micro scales. The series which will be given on Thursday evenings, begins on 11 January.

"Distillation" is the subject of a course of eight lectures to be given by G. A. Dummett, M.A., A.M.I.Chem.E., on Friday evenings, beginning on 12 January.

A continuation of the former series of lectures on radioactivity will be given in a series of six lectures and demonstrations on "Radiochemical Methods of Analysis," commencing on Tuesday, 16 January. The three speakers will be A. A. Smales, B.Sc., A.R.I.C. (Atomic Energy Research Establishment, Harwell), D. A. Lambie, B.Sc., A.R.I.C. (Radiochemical Centre, Amersham) and J. E. Page, B.Sc., Ph.D., F.R.I.C. (Research Division, Glaxo Laboratories, Ltd.)

In the physics department a special course of 10 lectures will be given on "X-Ray Crystallography," by L. A. Thomas, B.Sc., F.Inst.P. (Research Laboratories of the G.E.C.), beginning on 4 January. The lectures, to be held on Thursday evenings, will deal with the principles and methods of X-ray analysis.

Other courses announced include seven lectures on "Petroleum Refinery Practice," beginning on 11 January under the chairmanship of R. B. Southall; and a laboratory course on "Solid Fuel Analysis," by L. J. Edgcombe, B.Sc., A.R.I.C., on Monday evenings from 8 January.

FREE NITROGEN

FOR some time it has been maintained that organisms within the soil are able to capture free nitrogen from the air. Although this has been disputed from time to time, so much weighty evidence has been offered to support the theory that it is now generally accepted as fact. Leibig went even further, and argued that the parts of plants above ground were also able to make use of the free nitrogen from the air. This became the subject of a fierce controversy between Leibig and Lawes until these later theories were discredited.

It has always seemed possible that nitrogen should be captured either during respiration or by direct absorption, and also that other chemicals in extreme dilution might be absorbed as well. For example, by merely spraying the foliage of certain crops with extremely weak solutions of metallic salts, it has been found possible to remedy trace element deficiencies.

Nitrogen, however, is the staff of plant life, and if it were possible to prove that the vegetative cover is continually taking nitrogen from the air, then some important knowledge would have been gained. The next step would then be to discover which type of plant growth captured most nitrogen, and how the rate of absorption could be increased.

South African Theory

A paper on "Soil Science" which merits attention has recently been published by Ingham, a South African chemist. He believes that soils are continually being supplied with appreciable quantities of nitrogen from the atmosphere because of the earth's vegetative cover. He suggests that, because of their colloidal nature, cellulosic substances are able rapidly to adsorb minute particles from aerosols. Ingham presents the theory of a continual and regular process whereby nitrogen is adsorbed, and then washed out by rain, so that the cellulosic substances can then adsorb further quantities. Meanwhile the nitrogen passes with the rain into the soil.

The author sets out to prove that, besides ammoniacal and nitrate nitrogen, other nutrients, such as lime and phosphorus, may also be adsorbed. He advances the theory that this constant adsorption of plant food collected by the organic matter above the soil, including tree foliage, may be of greater accumulative significance than the fixation of nitrogen by soil bacteria.

Ingham's views find ample support in clear evidence provided by delicate chemical analyses which were unknown during Leibig's lifetime. This provides a reason for Leibig's inability to refute the arguments of Lawes, and the fact that this important discovery has been delayed for so long.

According to Ingham, the rate of ammonia adsorption is trebled if cellulose is first washed with dilute acid. The cellulose can then adsorb more than 100 p.p.m. of ammoniacal nitrogen in a few days, though falling rain collects only about 0.5 p.p.m. of this nutrient. Cellulosic material, such as dried grass, wood and jute fibres, are said to have the same adsorptive properties.

Powell Duffryn Directors

THE board of Powell Duffryn Technical Services Limited announces that MR. A. L. G. DAVIES, M.I.Min.E., M.I.M.E.E. and DR. A. A. J. K. ESKREISS, Ph.D., Dr.Eng., have been appointed directors of the company. MR. J. G. BENNETT has resigned from the board.

Dr. Eskreiss, a chemical engineer of international repute, is a senior member of the staff of Powell Duffryn Technical Services Ltd., and is responsible for the direction of the synthetic fuels and chemical engineering division of the company. He has wide experience in designing, direction and operation of chemical plans in Great Britain and on the Continent. During the war he was a senior member of the staff of Imperial Chemical Industries Ltd., and afterwards was attached to the chemical branch of the Allied Control Commission in Germany where he was responsible for the rehabilitation of two Fischer-Tropsch plants in the Ruhr area. He has made an exhaustive study of the coal-to-oil conversion processes in the United Kingdom, Germany and the U.S.A.

Mr. Davies is a leading ventilation engineer and has had over 30 years' service with Powell Duffryn.

MR. JAMES B. MORGAN has joined the board of Wilfred Smith, Ltd., London. Mr. Morgan who has been with the company for over 25 years is also a director of its associate firm Fincham and Smith, Ltd.

Chemical Society Library

It is announced that the library of the Chemical Society will close for the Christmas holidays at 1 p.m. on Friday, 22 December and be re-opened at 10 a.m. on Thursday, 28 December.

TRIETHYL ORTHOFORMATE

TRIETHYL ORTHOFORMATE closely resembles acetal in many of its properties. It is stable in the presence of alkalis but unstable in the presence of acids. The ester is a volatile liquid possessing a pungent smell and having a boiling point of 145.9°C. at 760 mm. It is soluble in alcohol and ether and appreciably soluble in water. The specific gravity of triethyl orthoformate is 0.895 at 20°C. and the weight per gallon at this temperature 7.47 lb.

In common with normal esters, triethyl orthoformate undergoes ester exchange—e.g. when reacted with an alcohol in the presence of a catalyst trialkyl or triaralkyl orthoformate is formed. Another typical reaction is the formation of acetals or ketals, e.g. with grignard compounds the acetal of the aldehyde, which contains the organic residue present in the Grignard is given: acetals or ketals are formed with some carbonyl compounds in the presence of a catalyst. Of importance is the use of triethyl orthoformate as a source for the ethoxymethylene group, e.g. the reaction involving triethyl orthoformate and diethyl malonate in the presence of acetic anhydride gives alpha-ethoxy methylene malonic diethyl ester.

Using triethyl orthoformate as a raw material for making synthetic resins du Pont chemists have developed several interesting polymers. U.S. Patent 2,402,137 and Brit. Pat. 583,181 disclose a method of making resinous bodies called telomers by reacting the ester with ethylene gas under pressure.

$$C_2H_5 + HC(OC_2H_5)_3$$
$$H(CH_2CH_2)_n\ C(OC_2H_5)_3$$

The telomer is claimed to possess wax-like properties which qualify it for use as a wax substitute.

Another du Pont patent (Brit. Pat. 547,854) describes the reaction of triethyl orthoformate with beta gamma unsaturated alcohols (boiling above triethyl orthoformate) in the presence of esterification catalyst, to form unsaturated ortho esters, which may be polymerized to form useful resins. Interesting possibilities are opened up in the production of new plasticizers from the orthoformate and some of the trialkyl or triaralkyl orthoformates appear to offer some possibilities for the cellulosics.

Pakistan Paint Industry

The Pakistan Tariff Commission has decided that a *prima-facie* case exists for a full inquiry into the paints and varnishes industry.

PAPER CHROMATOGRAPH METHODS

A JOINT meeting of the Society of Public Analysts & Other Analytical Chemists and the Food Group of the Society of Chemical Industry, was held in the Meeting Room of the Chemical Society, Burlington House, London, on Wednesday, December 6. The president, Mr. George Taylor, O.B.E., F.R.I.C., having opened the proceedings, invited Mr. A. L. Bacharach, M.A., F.R.I.C., chairman of the Food Group, to occupy the chair for the remainder of the meeting.

Rapid Separations Possible

In their paper—" Applications of Paper Chromatographic Methods in the Sugar Industry "—H. C. S. de Whalley, F.R.I.C., M.I.Chem.E., N. Albon, B.Sc., A.R.I.C., and D. Gross, Dip.Ing., Ph.D., explained that separation of sugars of interest to the sugar industry could be made rapidly and quantitatively by the procedure used by Dr. S. M. Partridge, of the Low Temperature Research Station, whose advice and assistance at the beginning paved the way for the later investigations.

Heat degradation products of fructose, the more labile reducing sugar, were separated and, by co-operation with F. W. Zerban and L. Sattler, were found to be identical with the non-fermentables of cane molasses. Some "compounds" were shown to be mixtures.

By paper chromatography, raffinose in raw beet sugar could be estimated with precision and certainty for the first time. The degree of purity of sugars such as raffinose had been determined. Freedom from traces of sucrose could previously only be inferred, as the exact physical constants of the sugar were open to conjecture.

Mixtures of starch hydrolysis products, such as those present in beer, could be separated and identified quantitatively.

The Lobry de Bruyn conversion could be demonstrated by means of paper chromatography, to show the equilibrium concentrations of glucose, fructose and mannose and also the presence of another sugar, allulose.

At intermediate stages of sucrose inversion by invertase the appearance of at least one synthesised tri-saccharide had been noticed.

Chromatographic methods made examination of the organic and inorganic non-sugars, including colouring matters, a relatively simple matter, but much further investigation into the identification of the separated products was required.

The Chemist's Bookshelf

UNFAMILIAR OXIDATION STATES AND THEIR STABILISATION. Jacob Kleinberg. 1950, Lawrence, Kansas: The University of Kansas Press. Pp. viii + 181. Figs. 8. $3.

This is a short work of about 80,000 words, and consists of a series of short monographs on related topics in inorganic chemistry with which the ordinary chemist is perhaps not so familiar as he might be or as he ought to be.

Unfamiliar oxidation states have many aspects of importance at the present time, both from theoretical and practical points of view. Thus, on the one hand study of lower oxidation states of elements such as gallium and indium, and relation of the observations to the known behaviour of thallium and the suspected behaviour of aluminium, is of importance in any comprehensive study of the periodic properties of the elements.

From a quite different viewpoint, the less common valencies of 2 and 4 in the lanthanons has proved of the utmost importance in certain separations of these intractable elements. Again, iodine and the artificial element astatine (85) which completes the halogen group show a most interesting series of analogous behaviour. These help to explain the tendency of iodine to exist in unusual valency forms hitherto regarded as somewhat anomalous. Finally, stabilised complexes in which the central element is present in a normally unstable valence form may be of importance in modern analytical procedures.

All these unfamiliar valency states provoke interest, and Dr. Kleinberg has done chemists a service in presenting within one cover a unified account of the more important of them. The principal elements dealt with are the aluminium group, oxygen, the halogens, copper and silver, chromium and manganese, iron, cobalt and nickel, and the lanthanons. Undoubtedly one could supplement this list by the names of other elements which might be considered worthy of inclusion, but the author claims to have dealt only with those cases which he himself has found most interesting.

It is commendable that a serious effort has been made to present the material critically, so that while the treatment of each element is full and accompanied by a comprehensive literature survey, some form of conclusion is reached or suggested in those cases where controversy still exists. That the reader may not always agree with the conclusion should not be taken as any implied criticism of the author's treatment, but merely as an indication that in certain cases there is clearly a need for further investigation.

This book should have a ready sale both to students and to research workers who have to deal with any element which has actual or potential variable valency—this rightly implies practically every worker in the inorganic field. The bearing of the book extends far beyond the catalogue of elements specifically discussed within its covers. If nothing else, it serves to emphasise certain aspects of inorganic chemistry which are scarcely dealt with in the average general textbook.

This book has one or two minor blemishes, the lack of an author index, for example, and the mild inconvenience found in consulting the references, which are not readily identified without first ascertaining the number of the chapter which one is reading.—C.L.W.

Promacetin for Leprosy

Successful treatment of leprosy is claimed for promacetin, a new drug developed in the U.S.A. A white crystalline compound, taken by the mouth, promacetin is said to bring quicker relief with fewer adverse reactions than other leprosy drugs.

Confused Identities

In the report of the dinner to mark the centenary of Hopkin and Williams, Ltd. (THE CHEMICAL AGE, 63, 771), a toast in honour of the company was stated to have been proposed by Dr. L. H. Lampitt. The toast in question was actually proposed by Professor R. P. Linstead, professor of organic chemistry, and director of the organic chemistry laboratories, Imperial College of Science and Technology.

We regret any embarrassment this inaccuracy might have caused.

OVERSEAS

Colombian Fertilisers and Asbestos

A six million peso enterprise to produce ammonia for the manufacture of chemical fertilisers is shortly to be set up by the Caja de Credito Agrario y Minero, the National Coffee Federation and the Instituto de Fomento Industrial. The last-named also proposes to exploit large asbestos deposits existing in various parts of the Department of Antioquia.

Chemical Progress in Hungary

Satisfactory development of the chemical industry is reported from Hungary. Production in the first half of this year is estimated to be nearly 50 per cent greater than in 1949. Manufacture of aniline dyes is now said to be sufficient not only for home consumption but also for export. Exports which include metallic oxides, industrial acids, gelatin, and industrial alcohol have trebled the 1949 figure.

To Publish History

The Mallinckrodt Chemical Works of St. Louis, Missouri, is shortly to publish an outline of chemistry, which is expected to have a permanent value for chemists and teachers. The work begins with the pre-Christian origins of chemistry in India, China and Egypt and traces the evolution of chemistry up to the present time.

New Roasting Process

What is described as "a revolutionary" roasting process for the concentration of arsenical gold ore from the quartz reef was demonstrated to metallurgists and mining men at Industria, Johannesburg, on 29 November. The pilot plant, which is a flash oxidiser, is said to roast sulphides in the refractory ores without any of the disadvantages of the orthodox furnaces.

A New Silicone Rubber

The chemical department of the (U.S.) General Electric Company at Pittsfield, Massachusetts, has developed a new silicone rubber compound said to permit rubber fabricators to mould more readily silicone rubber with highly improved mechanical and thermal properties. Many parts can be fabricated from the new 81223 compound without prolonged oven cure, and it is said to have excellent moulding and extrusion properties after only five minutes' heating.

New applications for silicone rubber mechanical goods, including diaphragms, sleeves, belting, hose and mountings, are expected to evolve from the new compound.

Canadian Ammonia Plant

Dow Chemical of Canada, Ltd., will build a plant in Sarnia, Ontario, to produce anhydrous ammonia. Contract for the construction of the new plant has been awarded to the Austin Co., Ltd., and construction will start immediately.

The plant will, to a large extent, be similar to facilities that currently are operated by the Dow Chemical Co. at Midland, Michigan, and Freeport, Texas. The engineering for the project is being handled jointly by the Sarnia and Midland engineering departments. Total cost of the plant will be somewhat more than $1 million (roughly £333,333).

The principal raw material to be used is hydrogen, which is now being produced in the Dow chlorine-caustic plant at Sarnia. The new plant will combine this hydrogen with nitrogen from the air, under high pressures, to produce ammonia. Designed capacity of the plant is 15 tons of ammonia per day and provisions are being made to permit rapid expansion if this is found to be desirable. At the present time ammonia is produced by several other companies in Canada, principally in Alberta, British Columbia and Ontario.

Influence Felt

The impact of allocations imposed by suppliers on chemicals in the United States during recent weeks because of defence orders is beginning to be felt in Canada. These allocations are based on consumption during the current year.

Most notable of these imports is methanol, which is a raw material for jet fuels, formaldehyde, resins, bakelite and some plastics. The United States is still recovering from the widespread strikes which hit alkali producers earlier this summer. These strikes have created a large back-order position in the glass industry because of soda ash shortages and numerous chlorinated organics because of the lack of chlorine. In Canada chlorine has been tight and has affected the supply of chlorinated solvents. Most notable are perchlorethylene, trichlorethylene and carbon tetrachloride.

Chemical prices are continuing to rise both in basic chemicals and further manufactured items. Price increases of process chemicals announced during recent months are now showing their effect in such items as paper, rubber, textiles and numerous other commodities.

· HOME ·

Byproducts from New Coke Ovens

Two new batteries of coke ovens at the East Greenwich works of the South Eastern Gas Board were opened on December 7 by the Duke of Gloucester. The new coke oven plant will carbonise about 1000 tons of coal every day, producing 18.5 million ft. of gas. Byproducts per day will be: 700 tons of coke, 25,000 lb. of ammonia, 10,000 lb. of sulphur, 3000 gallons of benzol, and 10,000 gallons of tar.

Non-Ferrous Metals for Britain

A total of 5400 tons of non-ferrous metals were scheduled to arrive in Britain last week. The shipments, due from the U.S.A. and Canada under the Marshall Plan supply programme, include the following items (in tons): aluminium ingots 2400; zinc, 1330; lead, 850; copper 820. Other Marshall Aid cargoes expected in London include 384 tons of steel and over 300 tons of carbon black.

Cosmic Rays Underground

Research into the penetrating powers of cosmic rays from the upper atmosphere is being carried out by two scientists at Holborn and Arsenal underground railway stations. The work is intended to supplement that at present being carried out by means of cloud chambers and magnetic deflecting instruments and by high altitude research.

To Perpetuate Memory

In the Council room of the Pharmaceutical Society after this month's meeting on 6 December, the president, Mr. Adam Meldrum, accepted an oil painting of Mr. A. R. Melhuish, president in 1930-2, who died last April at the age of eighty. The painting was unveiled by Mrs. Melhuish who was presented with a photograph of it by Mr. R. Woolby Brooke, chairman of the Western Branch of the Society of which Mr. Melhuish was a prominent member for many years, and which was responsible for having the painting executed. Mr. Melhuish, said Mr. Meldrum, had attended council meetings in that room for more than thirty years, a period which few members of the council could have exceeded throughout the Society's history. They realised how fitting it was that he should be looking over the scene of so many years of labour in the interests of pharmacy. His portrait would help to keep green the memory of one who had a special claim to be remembered for both what he was and what he did.

Record Steel Output

The highest figure ever achieved in steel production was attained in November, output reaching an annual rate of 17.472 million tons. The previous record rate of 17.147 million tons a year was established in March this year. At the present rate of production it seems probable that the total for 1950 should reach about 16.4 million tons compared with the target of 15.75 to 16 million estimated in the Economic Survey.

U.K. Solvent Separation Plant

The only solvent separation plant of its kind to be found outside the United States has been brought into operation by Price's (Bromborough), Ltd. The plant is used for the separation of solid and fatty acids in the manufacture of stearines and oleines. Stearines are used in the manufacture of cosmetics, tooth pastes, and shaving soaps and creams, and oleines for oiling raw wool, as a textile oil in artificial silk manufacture and in the manufacture of dyestuffs, stencils, carbon papers, printing inks, metal and boot polishes, insecticides, lubricating oils and paints. The firm itself produces only the fatty acids and oils used by industries in this country and abroad, including the U.S. and Canada, in the manufacture of a great variety of products. The plant is in an entirely new building erected and equipped at a cost of between £300,000 and £400,000. The company, of which Mr W. F. Darke is chairman, make a considerable contribution to the export trade of Great Britain.

Census Arrangements

An Order indicating the scope of the Census of Production to be taken in 1951 in relation to the year 1950 has been made by the Board of Trade. Undertakings producing coal, gas, electricity, oil shale, crude or refined petroleum or shale oil products are exempted from making Census of Production returns to the extent to which they supply the necessary information to the Minister of Fuel and Power.

The title of the Order, which operates from 30 December 1950, is "The Census of Production (1951) (Scope, Returns and Exempted Persons) Order, 1950." Copies may be obtained from His Majesty's Stationery Office or on order through any bookseller.

The Stock and Chemical Markets

THERE has been a steadier tendency in stock markets this week, although at the outset very little improvement in the volume of business was reported, caution prevailing prior to the Prime Minister's statement on his talks with President Truman. Apart from the vital questions of foreign affairs, there is anxiety as to supplies of essential materials, prices of which are rising owing to world rearmament. Because of rearmament requirements it is clear that there may have to be very drastic rationing for industry, unless the U.S. makes larger supplies of base metals and other commodities available to Britain. Until the raw materials position becomes clearer it will be very difficult to estimate prospects. Meanwhile, attention may centre mainly on rearmament shares and those of export trade companies.

Chemical and kindred shares are at present tending to attract rather more attention, because of the importance of the chemical industry both in rearmament and the export trades. The tendency is to favour shares of companies with widespread and varied chemical and kindred interests.

Imperial Chemical have been more active and have recently strengthened to 42s. 6d., on general confidence that the year's total dividend will again be 10 per cent. Fisons firmed up to 25s. 3d. after an earlier small decline. Monsanto have been steady at 50s., with Albright & Wilson 5s shares at 30s. 9d. Boake Roberts eased to 84s. Amber Chemical 2s. shares were 2s. 6d., F. W. Berk, 12s. 6d., Bowman Chemical, 5s. 9d., Brotherton, 21s. 3d., and Pest Control, 7s. 3d. W. J. Bush rose further to 82s. 6d. and the company's 5 per cent preference were 22s. 9d.

Dunlop Rubber rallied to 54s. 3d., British Oxygen, at 86s., showed firmness again on the success of the big new issue, and higher dividend hopes were inclined to draw rather more attention to Turner & Newall at 82s. United Molasses, at 46s., have also strengthened a little. The 4s. units of the Distillers Co., at 19s 3d., held steady and Lever & Unilever at 41s. were also well maintained.

British Aluminium at 38s. 6d. improved a little. Triplex Glass, at 26s. 6d., showed firmness, on the expectation of a further increase in dividend this year.

There was again little movement in iron and steel shares. Guest Keen at 47s. 9d. were a little lower on balance. Dorman Long, at 31s., lost an earlier small improvement. Electrical equipment shares were inclined to ease because of the growing shortage of zinc.

Boots Drug at 48s. 6d. held up quite well, Borax Consolidated 55s. 6d. were again firm, and General Refractories, at 24s. 3d., held most of their recent improvement. Tube Investments, at £6¼, were well maintained on the news that five million new preference shares are to be offered to shareholders at 20s. each. There was again a good deal of activity in Glaxo Laboratories around 56s. 6d., on the view that when more capital is required it is likely to be raised by an offer of additional shares to shareholders.

Oil shares have firmed up on news of a further increase in U.S. crude oil prices. Shell were better at 65s.

Market Reports

THERE has been little change in the position on the home market for industrial chemicals where an active demand continues to be experienced in most sections. The volume of export inquiry is well maintained though actual bookings for shipment are in some cases restricted by a shortness of supplies. The price of acetone was increased last week and the product is now £15 per ton higher. With the undertone throughout the market remaining strong some price increases would seem probable although no actual changes have been notified at the time of going to press. Trade in the coal tar products was steady but supplies of some items are becoming increasingly difficult, particularly the light distillates.

MANCHESTER.—Strong price conditions continue in most sections of the Manchester chemical market. Buyers are experiencing difficulty in covering some of their requirements. A wide range of products for the textile and allied trades are in good demand and other leading industrial chemicals are finding a steady outlet. Delivery specifications for these are circulating freely and there has been a fair amount of replacement business during the past week. The demand for fertilisers generally has been only moderate but there is a steady trade in most tar products.

GLASGOW.—Business in the Scottish heavy chemical market remained steady during the past week. There was an increasing demand but chemical supplies in most cases were limited. There has been no change in the export market.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MORLEYS ESSEX LIME CO., LTD., Newport (Essex). (M., 16/12/50.) November 10. £2000 debenture to W. Taylor, Worlington; general charge.

ORGANIC DYESTUFFS, LTD., Salford. (M., 16/12/50.) November 8, debenture to Barclays Bank Ltd.; general charge. *Nil. August 28, 1948.

A. S. PRICE AND CO., LTD., Birmingham, chemists. (M., 16/12/50.) November 9, £8700 mortgage, to Rowley Regis and District Benefit Building Society; charged on land, warehouse and premises at Corngreaves Road, Cradley Heath. *£5895. December 31, 1946.

D. RILEY, LTD., Liverpool, chemists. (M., 16/12/50.) November 7, charge as confirmed and ratified by a resolution dated October 24, 1950, to Barclays Bank Ltd.; charged on 65 William Henry Street, Everton, Liverpool. *Nil. July 18, 1950.

Satisfaction

WESTERN OXIDE AND PAINT CO., LTD., Slough. (M.S., 16/12/50.) Satisfactions November 7, of mortgages registered September 17, 1948, and January 19, 1950.

Release of Receivership

ANSOL CHEMICAL CO., LTD., 4 Broad Street Buildings, E.C.2. Eric S. Smith, of Faraday House, 17 Todd Street, Manchester, ceased to act as receiver on November 9, 1950.

Company News

Nitrate Merger

The Lautaro Nitrate Co., and the Anglo-Chilean Nitrate Corporation have announced that full information of the proposed merger of the two companies will be submitted to shareholders as soon as the legal and other problems involved have been considered, and a complete plan developed.

New Registrations

Gordon Chemical Company, Ltd.

Private company. (488,924). Capital £1000. Manufacturers of chemicals, liquids and gases, alkalis, acids, plastics, fabrics and synthetic preparations. Directors: R. I. Burr and G. A. Burr. Reg. office: Cliffords Inn, E.C.4.

Descalite Chemical Industries, Ltd.

Private company. (488,917.) Capital £1000. Manufacturers of compositions and solutions for the removal of scale from boilers, domestic and industrial equipment, etc. Directors: F. G. Kafell and J. H. W. Bowen. Reg. office: 1 Peel Road, South Woodford, E.18.

A. W. Munns & Co., Ltd.

Private company. (489,145). Capital £25,000. Manufacturers, importers and exporters of perfumes, oils, essences, etc. Subscribers: Mrs. G. L. Munns and A. W. Munns. Solicitors: Freshfields, 1 Bank Buildings, Princes Street, E.C.2.

Rubber Suspension, Ltd.

Private company. (489,008). Capital £1000. Manufacturers of component parts of complete units in moulded rubber, ebonite, latex or thermosetting plastic materials. Directors: E. E. Wynn and C. Wynn. Reg. office: 121 Finchfield Lane, Wolverhampton.

NEXT WEEK'S EVENTS

TUESDAY, DECEMBER 19

Society of Chemical Industry

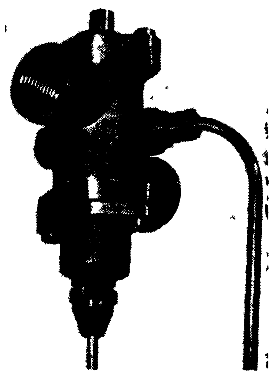
London: Manson House, Portland Place, W.1. 6.30 p.m. A. Fowler Williams: "A New Monomer, Acenaphthylene, Its Polymers and Copolymers."

Mr. George Mackay

THE death has occurred at his home, 12 Prospecthill Road, Glasgow, of MR GEORGE MACKAY, a director of Messrs. W. and R. Hatrick, Ltd., manufacturing chemists, Glasgow. A native of Helmsdale, Sutherland, where he served his apprenticeship as a chemist, Mr. Mackay came to Glasgow in 1880 to join the staff of W. and R. Hatrick. He travelled for the firm for a number of years, and became well known to doctors and chemists over a wide area of Scotland. In 1934 he was appointed a director, and last month completed 70 years' service. Mr. Mackay, who was widely known in Masonic circles, was 89 years of age.

Technical Publications

AN automatic pilot device which can be used either on town's or liquefied fuel (petroleum) gases is the Teddington Type TJ, described by the British Thermotsat Co., Ltd., in its advance technical publication AT/25A. The device comprises four main components: a shut-off valve and an electromagnet contained in the main housing, and remote from it, a thermocouple and pilot burner. The thermocouple is positioned within the pilot flame, and the current thus generated energises the electromagnet and holds open the valve, which remains open as long as the pilot flame is properly alight. But if the flame becomes extinguished (for any reason whatever) the thermocouple ceases to energise the electromagnet, the armature is released, and the valve closed with a positive snap action.



[By courtesy of The British Thermostat Co , Ltd

CYANIDE regeneration applied to the treatment of refractory, complex or copper bearings ores as practiced by the Compania de Real del Monte y Pachuca, Hidalgo, Mexico, is described by Frank A. Seeton, in "Deco Trefoil" (Vol. 14, No. 5) published by the Denver Equipment Co., Colorado, U.S.A. Silver ore is treated in the modern cyanide plant Pachuca at the rate of 8100 metric tons per 24 hours. Addition of flotation to the cyanide circuit has resulted in increased precious metal recovery and important amounts of copper and lead.

* * *

CHEMISTRY of iron and steelmaking played an important part in the research and development programme for the year ending 30 June of the United Steel Companies, Ltd. The construction of extensive new laboratories has been undertaken at Swinden House, Rotherham. It is hoped that the new buildings covering approximately 45,000 sq. ft. of working floor area will be in possession of the research department by the end of next year. These facts are given in the second report to the staff and employees issued by the company as a "Review of Progress 1950." The brochure contains a number of striking photographs and some useful charts and diagrams.

* * *

PROBLEMS of flaking in continuous vertical retorts form the main section of the 41st report of the refractory materials joint committee of the Gas Research Board and the British Ceramic Research Association, which has now been issued as Communication GRB. 58.

* * *

ION EXCHANGE is the subject of a booklet just issued by the British Drug Houses, Ltd., in which "Notes on the Laboratory Use of Ion Exchange Resins" are given. The general concepts of ion exchange technique are considered and applications of the resins in analysis, as catalysts, and in various physico-chemical determinations, are discussed. Reference is made throughout to the Amberlite series of resins, which B.D.H. distribute in Great Britain for the Rohm & Haas Company of America. A useful list of literature references is appended.

* * *

FILMS on scientific and medical topics—which may be borrowed free of charge—are listed in the new I.C.I. film catalogue just published. The catalogue is divided into five main sections: medical, agricultural, general interest, films for schools, and films about I.C.I. All the films are sound films and are in the 16 mm. size only. Many are coloured. Further information regarding the loan of these films may be had from the I.C.I. Film Library, Bolton House, Curzon Street, London, W.1.

Record Wolfram Price

Wolfram prices reached a new high level on 11 December, being quoted at 325s. to 345s. nominal per unit c.i.f. European ports. The previous peak level was about 160s. in 1947. At the beginning of January this year the price was 90s. to 95s. per unit (against 75s. a unit at the time of devaluation) from which it has gradually risen to the present record.

Need for Synthetic Rubber

THE need to establish a synthetic rubber industry in the United Kingdom, even under conditions of an assured world peace, was stressed by Mr. G. E. Beharrell, Dunlop's managing director, at the Institution of the Rubber Industry dinner in London on 8 December.

British consumption of rubber, said Mr. Beharrell, had risen from 18,000 tons to 215,000 tons since 1921. " The worsening international situation and the urge for stockpiling by our friends, chiefly in the United States of America, has," he said, " altered the whole statistical, commercial, and technical problems of our industry. The year 1950 has seen the revival on a large scale of the great synthetic rubber industry.

" When U.S. stockpiling is completed," he asserted, " it is difficult, in spite of the obvious appreciation over there of the importance of the Far Eastern economy in world peace and for the need of economic expansion in the Far East, to visualise the return of the synthetic rubber indusry to volumes which were under contemplation only some twelve months ago."

Price levels were so high that they threatened the expansion of important technical developments which would be required if a reasonable adjustment between supply and demand was to be maintained.

Technical and marketing research must be continued at the highest level. " Our position," said Mr. Beharrell, " viewed from the point of view of war potential, would also warrant further examination."

IN THE EDITOR'S POST

Estimating Moisture

SIR,—In the recent article by Mr. Alan H. Ward on " Methods of Estimating Moisture " we would agree that the most accurate method is the simple drying method. He says, however, that it takes up to three hours and if our experience is any guide it would be difficult to find an operator who could do 150 tests in an eight hour day. With a large number of materials too, the first sample would have lost in weight before 50 samples could be weighed.

To the scientist, however, facts are important and as British manufacturers of the Brabender Moisture Tester we should like to point out that there is no spring balance in the apparatus. The balance has knife edges on the chemical balance principle. Contrary also to Mr. Ward's statements the oven is tied neither to times or temperatures. The current of air is the essential future of the machine. (This principle has been accepted by the Government laboratory in their tests on tobacco.)

If figures are important, in America a time of half an hour is given for ten tests which on an eight hour day gives 160 moisture tests a day. We ourselves would merely state that the Brabender Moisture Tester has been in use all over Europe, America and England for the last twenty years which speaks well for the principles it embodies.—Yours faithfully,

E. E. VOSS, B.Sc.

Voss Instruments, Ltd.

Brazilian Caustic Soda Development

THE Companhia Nacional De Alcalis (THE CHEMICAL AGE, 22 April, 1950, page 579) appears to have overcome its financial difficulties and should start building the factory at Cabo Frio within the next few months. The Export-Import Bank of Washington is to increase its loan from 7.5 to 10 million dollars and the Bank of Brazil will advance 50 million cruzieros £1,000,000). The factory is designed for an output of 45,000 tons of caustic soda, 33,000 of barilla and 4,000 of bicarbonate. The existing factories in Rio and San Paulo produce only 4,000 tons of caustic soda annually, by electrolytic processes, while national consumption amounts to 90,000 tons of caustic soda and 60,000 of barilla. The construction of a second factory, similar to that at Cabo Frio, is therefore under consideration.

The cost of producing caustic soda and barilla at Cabo Frio is estimated, perhaps somewhat optimistically, at 814 and 329 cruzieros (£16 5s. 7d. and £6 11s. 7d.) per ton, while the market prices for British products are in the order of 2400 and 1200 cruzeiros.

The
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The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Monopolies and Restrictions

THE first report of the Monopolies and Restrictive Practices Commission—on the supply of dental goods—was published by His Majesty's Stationery Office on 14 December. On the same day it was announced that the next two commodities to be investigated will be (a) certain semi-manufactured products of copper and copper-based alloys, and (b) insulin. In the case of insulin, the investigation will cover supply in the United Kingdom only. In the case of the copper and copper-based alloy it will also cover exports. By the terms of reference which have been made, the Commission is required to make a report to the President of the Board of Trade on the facts of the case. The reference of insulin also requires the Commission to report about the bearing of the facts on the public interest.

The Monopolies Commission was the offspring of the Monopolies Act of 1948 -the first important piece of legislation on this subject to be passed by the British Parliament for more than three centuries. It is 20 months since references were made for the Commission to investigate the supply of dental goods and its report has just appeared, and now that it has come out, there is evidence to show that the Government is having great difficulty in making up its mind what to do. The Commission has still to prepare reports on builders' castings, electric lamps, insulated cables, matches and match-making machinery—not to mention insulin and copper and copper-based alloys. It is, therefore, obvious that the Government must take steps soon to pass legislation which will give effective support to the Commission. Monopolies and near-monopolies are not hard to find and restrictive practices are quite common. It may be that the Commission will find that conditions are. not so great a menace as some rabid Socialists believe, but still some restraining influence will be necessary, and it is highly likely that the Government will find that dealing with monopolies is a very complex problem.

Last Thursday's report revealed that while the dental goods industry was dominated by one company—the Amalgamated Dental group—and the Association of Dental Manufacturers and Traders of the United Kingdom, most of the charges commonly directed against monopolies were unfounded. The Commission found that the Amalgamated Dental group had used its monopolistic powers with moderation. Its report reveals, however, that it found that the group is a monopoly within the meaning of the Act. It found that there were restrictions

placed upon entry into the industry and that exclusive dealing and the collective boycott were designed to enforce retail price maintenance. During the past 15 years (the report states) nearly half the applications from manufacturers were rejected and among dealers the proportion was even higher. As the Commission decided, these restrictions are definitely against the public interest. They are the negation of free enterprise and they should be stopped. When Imperial Chemical Industries tried to oppose the monopoly and wanted to supply hospitals with material for making false teeth at a special discount, it was not allowed to do so.

A majority on the Commission would like to see legislation directed specifically against the activities of the dental trade association, but two members argued that legislation against a single industry would be unfair because many trades are guilty of the same thing. Mr. Harold Wilson has said that the Government is considering whether to legislate against monopolies one by one or to deal with all in a general act. There is something to be said about the unfairness of "picking on" one industry, but the passing of a law to prohibit exclusive dealing and collective boycott is a serious matter. Most trade associations believe that these are essential for the protection of their members. They remember only too clearly the evil days of ruthless price-cutting and (in many cases) the hopelessness of trying to compete with "dumped" or cheap imports. The Lloyd Jacob Committee last year reported against the use of collective powers to maintain prices. It also recommended that steps should be taken to make illegal the "application of sanctions which extended beyond the remedies open to any individual producers for any breach of resale price maintenance conditions." Legislation is undoubtedly necessary to prohibit monopolies acting against the public interest and this should cover industry in general rather than a few selected industries. But if this is done, would it be fair to allow the unions to limit the intake of labour into an industry and to insist upon the "closed shop"? Trade union officials claim that this control is necessary as a protection against a recurrence of the mass unemployment of the late 'twenties and to keep the "price" of labour at a reasonable level. But surely that is just what certain trade associations are endeavouring to do—to protect their members against over-production and uneconomic prices. The Government should consider the matter very carefully before taking any drastic action.

On Other Pages

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Notes and Comments

Personality in Industry

THE retirement of Lord McGowan from the chairmanship of Imperial Chemical Industries, Ltd., will be regretted far beyond the ever-widening influences of the company. A man of vision and courage and a believer in unremitting, relentless work, Harry McGowan, who joined Nobel's Explosive Company in a humble position as a boy of fifteen, has become one of our greatest industrial leaders. The chemical industry is rich in firms which have in the past owed their development and expansion to the personality and initiative of their founders. Chemistry, which tends to play an increasingly important rôle, not only in the national welfare but in its influence on world affairs, will still, it is hoped, continue to attract those who not only have the expert's knowledge but also the drive and initiative required of great leaders. While having every faith in the rising generation of chemists, it is hard to see that the same opportunities await them in these days of controls and difficulties and in an industry overshadowed with the threat of nationalisation. Mr. John Rogers, who succeeds Lord McGowan, has been actively associated with I.C.I. and its predecessors for many years. He can rest assured of best wishes and confidence in his ability to carry on the great work begun by predecessors.

Anhydrite—or Worse?

THE imminent threat to Britain's supplies, caused by the American decision to curtail shipments to Europe in the new year, is (as we have said before) the subject of grave concern, both in the sulphuric acid industry and outside it. The realists—or the pessimists ! -are already surveying alternative sources of the various minerals from which sulphuric acid can be made. Chief and most attractive of these is anhydrite. Deposits in Great Britain are large. Sulphuric acid processed from anhydrite is of high quality and there is the added advantage that a useful by-product, Portland cement, can be made from the residue. Unfortunately, the cost of building new plant is going to be high. The capital outlay involved will impose a fresh burden upon the chemical industry and upon the long-suffering public, the more especially since Marshall Aid is soon to stop. If, as is likely, the Government provides some assistance to firms who wish to build plant to use alternative raw materials for sulphuric acid production then the burden may be greater still. The tax payer will then have to finance the project directly. Happily there is a chance that improvisation may be largely avoided. The OEEC commission, now in Washington, may be able to persuade the U.S. Government to increase the export allocation of sulphur to the United Kingdom. The international situation may provide a convincing argument in Great Britain's favour. But, unless quick, decisive action is taken one way or another, then sulphuric acid is going to be very scarce for some time. The long-term policy of producing sulphuric acid from anhydrite needs to get under way now, if Britain's further economic recovery is not to be severely handicapped.

CHRISTMAS GREETINGS

The editor and staff would like to wish all readers the happiest and most enjoyable Christmas they have ever had. They would also like to thank contributors, correspondents, association and society secretaries, public relations officers and all others who have helped them produce each week what they hope has proved an interesting and informative issue. Finally, they would like to express their appreciation to all those who have sent them Christmas greetings in one form or another and to express their regrets that pressure of work has not made it possible for them to personally acknowledge receipt of these.

Basic Chemical Stocks Lower

Some Improvement in Production

DESPITE some improvement in production during September, stocks of basic chemicals and non-ferrous metals were generally lower than in the same month of 1949. Reserves of sulphur, the future of which is causing considerable concern, were only (in thousands of tons) 77.3 compared with 91.5 last year. Other reductions in stocks (in thousands of tons) included: Molasses for distilling (cane and beet) 174.0 (221.8); industrial alcohol (million bulk gallons) 0.32 (3.91).

In production a higher yield was recorded in a number of basic materials, including (in thousands of tons) sulphuric acid 147.5 (139.1); and (million bulk gallons) industrial alcohol 3.14 (1.91).

Estimated numbers employed in all sections of the chemical and allied trades in September totalled (in thousands) 458.0 which was 3.9 higher than the previous month and 11.0 more than in September 1949. Distribution of workers was: Coke ovens, chemicals and dyes, explosives, etc., 260.9 (192.3 men, 68.6 women): pharmaceutical, toilet preparations, etc., 85.2 (43.5 men, 41.7 women); paint and varnish 39.0 (27.7 men, 11.3 women); mineral oil refining, other oils, greases, glue, etc., 67.9 (54.6 men, 13.3 women).

These figures and the details given below are abstracted from the current issue of the *Monthly Digest of Statistics*, No. 59, November 1950 (HMSO, 2s. 6d.).

BASIC CHEMICALS IN SEPTEMBER

	September, 1950 Thousand Tons			September, 1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	147.5	156.0	—	139.1	144.0	—
Sulphur	—	29.1	77.3	—	26.2	91.5
Pyrites	—	13.8	73.9	—	17.6	76.0
Spent oxide	—	16.0	189.1	—	14.6	173.8
Molasses (cane and beet)	12.8	50.2†	174.0	11.7	25.9†	221.8
Industrial alcohol (mil. bulk gal.)	3.14	3.34	0.32	1.91	2.27	3.91
Ammonia	—	7.11*	9.77	—	6.46*	4.20
Superphosphate	14.2	15.1	—	17.1	18.7	—
Compound fertiliser	147.7	109.0	—	162.8	143.2	—
Liming materials	—	443.9	—	—	546.7	—
Nitrogen content of nitrogenous fertilisers	20.42	18.35	—	19.70	22.28	—
Phosphate rock	—	74.0	329.6	—	84.9	255.2
Virgin aluminium	2.41	18.2	—	2.44	15.2	—
Virgin copper	—	33.4	121.4	—	31.0	145.2
Refined lead	6.55	15.6	71.2	2.44	17.4	63.4
Tin	2.50	2.96	—	2.28	2.41	23.5
Zinc concentrates	—	12.4	87.1	—	13.8	63.4
Magnesium	0.38	0.42	—	0.24	0.35	—
Pig iron	187.0	148.0	579.0	185.0	139.0	500.0
Steel ingots and castings (including alloys)	326.0	—	1,160.0	306.0	—	1,331.0
Rubber: Reclaimed	0.67	0.70	2.16	0.41	0.47	2.65
Natural (including latex)	—	5.88	40.3	—	3.73	47.4
Synthetic	—	0.06	0.88	—	0.05	1.45

* Average of five weeks. † Distilling only.

Visit to Research Institute

ONE HUNDRED and thirty pharmacists and doctors attended the "At Home," given by the scientific staff of Evans Medical Supplies, Ltd., in the Evans Biological Institute, Runcorn, on 13 December. The guests, from Liverpool, Warrington and Chester, were shown through the research and testing laboratories and saw demonstrations of the preparation and testing of modern biological products such as Heparin, Hyaluronidase, Cytochrome C and Vitamin B_{12}. There was also a display of techniques and developments in the preparation, standardisation and control of various medical, veterinary and pharmaceutical products.

World Tin Output Increased

WORLD production of tin is expected to reach a new post-war record of between 164.000 to 165,000 tons this year, compared with 162,300 tons in 1949.

Malaya's contribution this year, as leading world supplier, is estimated at about 58.000 tons. This is an increase of some 3000 tons over the 1949 output. About 46,800 tons has gone to the U.S.A., providing a dollar income of over $100 million.

Indonesian output with a total of 32,000 tons also shows an increase of 3000 tons over last year's figures.

World consumption is estimated for the year at between 148,000 to 150,000 tons.

MEASUREMENTS OF FADING COLOURS

ADVANTAGES of the spectro-photometer over other methods of measuring colour were emphasised by Mr. E. Waters, B.Sc., in an address on the application of the recording spectro-photometer in some colour problems to the London Section of the Oil and Colour Chemists' Association held on 13 December at a meeting presided over by the chairman, Mr. Leslie O. Kekwick.

Illustrating the instrument, Mr. Waters said that it was to be preferred to other systems because it was an objective form of measurement, independent of the operator and relying only on physical measurements and suitable calculations afterwards.

The device consisted of a spectrometer and a photometer. With it was measured the reflection of a coloured material or the transmission of a transparent medium, and the light that was reflected or transmitted in different regions of the spectrum.

The source of light was an ordinary tungsten filament lamp. There was a lens system, a glass prism, which split the white light into the different colours and wavelengths of the spectrum; then it fell on a mirror which reflected the light to the exit slit of the spectrometer portion; and in front of the mirror was a sharp knife-edge which isolated a narrow beam of the spectrum, and it finally emerged from the exit slit. Thus there was a means of obtaining one beam of light which eventually, by suitable prisms, was split into two.

Standard Magnesium Block

A standard magnesium block was used which reflected all the light which came on to it, and that was used as a reference. One of the two beams of light fell on the standard white, and the other fell on the coloured specimen. A continuous record was obtained on a chart on a revolving drum, from zero to 100 per cent reflectance.

Mr. Waters illustrated a physical pattern of the amounts of light reflected from a panel in the different regions of the spectrum. Since the pattern was due entirely to the selective reflection of the different regions of the spectrum, one thus obtained a complete measure of the physical properties of that pattern which gave rise to its colour.

But that was not sufficient. Having done all that was necessary by measurement, there arose the problem of interpretation. The effect of the different wavelengths on the colour response of the human being had to be considered.

In investigating a wide range of pigments it was considered advisable to have some objective means of measuring their fading properties, and the reflection of panels was measured after different periods of exposure. The light fastness of the pigments were not assessed by means of the curves obtained, but nevertheless a permanent record was achieved of the appearance of the panels at different stages during fading.

Expressed in Terms of Primaries

Most colours could be matched by a suitable mixture of three primaries, continued Mr. Waters. Any colour could be expressed in terms of those three primaries. It was also possible to calculate from those primaries what value would be obtained from any other three primaries. Actual measurements could be made of all the individual wavelengths comprising the spectrum; and if that could be done the specification could be derived for any mixture of wavelengths which might be reflected by a pattern.

The real problem in illustrating the plotting of colours in terms of a chromaticity diagram was to correlate results with the practical differences seen. The work of a number of investigators in this field was discussed, particularly attempts made to calculate just noticeable differences, taking into account differences of lightness and darkness.

To give an idea of the magnitude of those differences, Mr. Waters showed colour photographs of a number of patterns. Each photograph was divided into three panels. In the first and second variation was by ten noticeable differences, and in the second and third by 20 noticeable differences. The effect of a just noticeable difference in yellow was shown to be much greater than a just noticeable difference in blue. Reference was also made to the Munsell chart, illustrating differences in hue.

In some fairly recent work an attempt was made to examine a series of pigments for light fastness standards in replacement of wool patterns. A number of pigments were faded for various periods; by spectro-photometric records a number of percentible steps were separated and plotted for different pigments against time. The investigation was made in connection with some work for submission to O.C.C.A. for light standards.

In another connection the whiteness of certain paints was investigated, the purpose being to examine the yellowing and

loss of whitening generally of various resins. A number of experienced colour observers assessed the panels in order of whiteness, and an attempt was made to arrive at some correlation between the whiteness of the panels and physical measurements made by various methods.

A fact which stood out was that it was not the actual amount of light in terms of visual sensation which was so important, but the deviation of the white from an uncoloured appearance to a coloured appearance. Since the main deviation from white was towards yellowness, that was why simple reflection technique, particularly where reflection at the blue end of the spectrum was used, gave such a high degree of correlation between observed results and measurements.

Problem Important

The problem of the measurement of colour, concluded Mr. Waters, was very important, and there was very great need for colorimetric work in most colour using industries. Considerable problems remained, and without question the major one was the lack of detailed information on the colour solid from the psychological point of view.

In the discussion that followed Mr. R. F. G. Holness said that he was interested to note that, after Mr. Waters had gone to the trouble to produce a very beautiful spectro-photometric reflectance curve he had found that in order to handle it he had to introduce a high standard observer to get the thing back into some numbers that could be dealt with.

Presumably there was some very good reason for that, because it seemed to him that to introduce a subjective means of evaluation derived from an objective one was, on the face of it, a retrograde step. He had often hoped that it might be possible to express fading in terms such as areas under curves or those related with the degrees in height of the reflectance at the dominant wavelength, and so on.

Mr. Waters pointed out that ultimately we were concerned to measure colour in order that we could obtain a quantitative measure of what we saw. After all, the eye was the judge; the ultimate criterion was that of visual differences. But we had no means of expressing visual or human differences independently.

In dyestuffs there was an enormous range of fastnesses and a wide range of different types of fading; different textile finishings could also affect the behaviour of a single dyestuff. He mentioned an orange dyestuff which was very popular for viscose rayon, and which went brown when it faded. We had, therefore, to assess how fast it was, taking into account the objectionable nature of that brownness. An ordinary spectro-photometric curve would not do, and we had to relate it to visual appearance.

When the problem was dealt with by a number of observers of known colour vision we adopted a mean as the official standard, and from that we could say that by measurement we had made a difference of one noticeable step or ten noticeable steps away from the original pattern in terms of the standard observer. He agreed that that was based on subjective data; but we were dealing with subjective phenomena. Some people would not like a yellowish white, and he preferred a pinkish to a yellowish white. Unless we took account of such differences we could not solve the problem.

The possibility of giving an idea of the reproducibility of the results shown was raised by Mr. N. L. A. Pollards, who also asked if a comparison could be given of the sensitivity of the instrument in various colour regions with the sensitivity of the normal person.

Information of that nature was lacking, replied Mr. Waters. He was, he admitted, sceptical about the physical instruments, although he used them so much, and he had a wholesome appreciation of the sensitivity of the human eye; it was fantastically sensitive, particularly to hue, and not so much to lightness.

Eye Better than Instrument

For slight differences in tone in certain regions, the eye was certainly better than the instrument. The Americans did not appear to stress that very much, and in that respect he felt they were wrong. The instrument he used gave extremely reproducible results. But an enormous amount of work remained to be done, because we had no detailed information of all the colour solids either for the instrument or for the eye.

Dr. R. F. Bowles commented that the paper was very much more important than its title revealed. One wondered whether the author would consent to alter the title when it was published, because in the main he had dealt with the physical measurement of the fading of colours, which was practically a new subject and one of extreme importance in the paint and allied industries.

Presuming that the excellent colour illustrations that had been shown were obtained with the Hardy instrument, he said that even if we could afford to buy them we could not obtain them.

Pharmaceutical Uses for Para-Aminobenzoic Acid

THE esters of para-aminobenzoic acid, particularly the salts of its ethyl, η-butyl, β-dimethylaminoethyl, and γ-di- η-butylaminopropyl esters possess local anaesthetic properties and are of considerable value in medicine. The acid itself is also used in organic synthesis for the production of fine chemicals. Comparatively recently, attention has been given to the study of para-aminobenzoic acid as a constituent of the vitamin B complex and to the use of the acid or its sodium salt in the treatment of various diseases. Of particular importance is the recent work which has been done on the effect of the acid on the growth of man and animals. According to the Dispensatory of the U.S. (24th Edition, p. 1541 (1947)) and Ansbacher *et al*; Federation Proceedings (98 (1942)), this aromatic carboxylic acid has a beneficial effect on the growth of man and the higher animals. It appears to stimulate appetite and causes a general improvement in health. Para-aminobenzoic acid in small doses stimulates the growth of microbes and in larger doses hinders their development (Lecoq, Raoul and Solamides J.; Compt. rend 226:846-848 (1948)). At dilutions of 1:130 and 1:250 the sodium salt has definite bacteriostatic properties. Some use has been made of para-aminobenzoic acid for restoring the colour of greying hairs in human beings and as a preventive of nutritional achromtrichia (Martin, C. J., and Ansbacher, S.; J. Biol. Chem. 138; 441 (1941)) and others.

Reduction Method

Para-aminobenzoic acid is obtained by reducing the nitro-acid with such reagents as zinc and acid, ammonium sulphide and alkaline ferrous hydroxide. As a class the amino-benzoic acids are interesting on account of their amphoteric properties and their similarity to glycocoll in chemical character. The para acid in the pure state is a white or faint yellowish, fluffy, needle-crystalline powder, which is slightly soluble in cold water, and more soluble in hot water; freely soluble in alcohol and in ether. An 0.5 per cent aqueous solution of the acid has a *p*H 3.5-4.0. The melting point of para-aminobenzoic acid is 187-189° C. The sodium salt is a white to buff-coloured odourless, crystalline powder possessing a saline taste. It contains half a molecule of water. Sodium para-aminobenzoate is freely soluble in water, slightly soluble in alcohol, very slightly in benzene and in chloroform and practically insoluble in ether. The *p*H of a 0.5 per cent solution is 7.5-8.0.

The para acid possesses a very low toxicity index. Scott and Bobbins (Proc. Soc. Exp. Biol. 49:184 (1942)) found that the lethal dose for animals was about 2.8 gm. per kilo of body weight. In one repeated treatment of endemic typhus patients received doses up to 219 gm. of the acid over a period of eight days without having any manifestations of toxicity. The acid and its sodium salt are compatible with penicillin but have a harmful effect on the sulphonamides.

The Chemical Age Year Book

PRESENT day shortages and difficulties combine to make the maintenance of a high standard of production increasingly hard, and there is a tendency to accept the mediocre or less good, as the best which can be expected.

It is, therefore, a pleasure to see the high quality of THE CHEMICAL AGE YEAR BOOK for 1951, which in its specious maroon cover and gold lettering, is now being dispatched to subscribers.

The contents once again make available in compact form a quantity of useful data about materials, sources of plant, and technical, commercial and legal affairs. There are lists concerned with the principal chemical and allied organisations, research associations and administrative groups. Current literature for chemists is summarised and there is a comprehensive collection of chemical and metallurgical journals.

Among the new features are a survey of some new plastics and their applications; prospects for atomic power are reviewed; and the toxic factor in DDT is considered.

The Buyers' Guide, which has been considerably enlarged, remains one of the most informative directories for sources of plant, instrument and chemicals.

In the advertising, there are a number of striking colour pages.

The volume as usual contains a diary, and calendars for the current year and 1952.—J.A.Y.

ITALY'S CHEMICAL PROGRESS

1949 In Retrospect

THE chemical industry in Italy showed a fairly substantial progress in 1949 compared with the previous year. While prices tended to decline, in some cases the production indices (presumably based on weight) exceeded the figure of 100 taken as the pre-war (1938) standard. June and July were notable for the monthly general indices reaching 102, but for the remainder of the year they were about 90.

In the general survey of 1949 recently published by the ANIC (Assoc. Naz. dell' Industria Chim.) and the Istituto Centrale de Statistica details were given of some of the principal chemical products.

Fluctuated Widely

Contact sulphuric acid fluctuated rather widely from month to month but averaged 32,500 tons per month for the year, during which a new plant began operations. Chamber acid also showed wide variations reaching a peak of 69,000 tons in July and a monthly average for the year of 64,500 tons.

Home demand was good and exports exceeded those of 1948, mostly going to Austria. Total production of acid (chamber and contact) at 1.15 million tons was a little over that of 1938.

Among various inorganic salts for industry, boric acid and borax regained their pre-war level, and damage to the principal centre at Lardarello (fumaroles or hot springs, etc.) has been completely repaired. There has been remarkable recovery in exports, especially to central-eastern Europe. Sodium sulphate prices tended to decline owing to competition at home and abroad; while sodium sulphide was affected by restrictions in the electricity service, and exports declined.

Output of chromates and bichromates averaged 3000 tons a year and was mainly limited to the home market, as it was not possible to compete with principal foreign producers. Even so the 1949 figures greatly exceeded those of 1938.

Alkali production in practically all branches declined during the first part of the year, but showed some recovery later. Caustic soda, including electrolytic, totalled 176,000 tons—slightly above 1938 but much below 1948 as regards electrolytic; soda ash (anhydrous carbonate) was nearly 400,000 tons (350,000 tons, 1938). Exports of caustic were less, with reduced demand from India and Pakistan. Liquid chlorine exports showed a marked increase, especially to France and the Benelux countries.

Calcium carbide registered a remarkable decline, again owing to the shortage of electric power. Output was only 88,000 tons (145,000, 1948, 135,000, 1938), and exports were practically nil.

In the fertilisers group, 100 per cent synthetic ammonia averaged about 11,500 tons per month, an increase over both 1938 and 1948; total N_2 was 110,000 tons; phosphates (as P_2O_5) were 250,000 tons, or about the same as 1938; and copper sulphate was 75,000 tons, as compared with 125,000 tons in 1938.

Manufacture of dyes has been somewhat discouraged by foreign competition. Phthalic anhydride started the year fairly well, but demand and prices subsequently declined. Electric power shortage affected the production of methanol with consequent influence on formaldehyde. Output capacity for the former was about 24,000 tons and for the latter 20,000 tons per annum.

Acetic acid was subjected to severe home competition and limited demand with falling prices. Total capacity was about 30,000 tons. There were some imports from Switzerland and exports to France, Spain, Egypt and the Far East.

Among solvents, acetone was in strong demand and exports to France could not be fully supplied. Despite the high quality and prices conforming to the international level, however, U.S. competition was severe both in home and foreign markets. There were also large imports from England.

Consumption Figures

Some figures given of Italian consumption of solvents, included (in tons): acetone, 3500; butyl alcohol, 1200; alkyl acetates, 4000. Production of synthetic resins and plastics exceeded the pre-war level, and so far as the urea type was concerned the position was said to be fairly satisfactory, but imports of styrene, polystyrene, and polyvinyl chloride—particularly from the U.S.A.—were considerable. Home consumption of resins and plastics was estimated at about 8500 tons annually.

Of the raw material required for soap making some 30,000 tons was home-produced (sulphur, olive oil, tallow, bone grease, etc.) and 60,000 tons imported.

FUEL ECONOMY IN STEAM PLANT

The Use of Special Condensate Pumps

ALTHOUGH great thought and care is usually taken in the design and layout of boiler installations to ensure that a high efficiency is obtained, it is still quite common practice to return the condensate to the boilers from a hot well.

Various types of pre-heating, the use of special furnaces, stokers, and economisers, etc., all play their part in reducing the fuel to steam raised ratio, nevertheless, the most important factor has been over looked, mainly because a condensate pump of suitable design has not been available

Reference to Figure 1 of a typical steam plant layout, will show —

(1) A loss due to the reduction of condensate from the boiler pressure temperature to atmospheric pressure temperature (212° F. (max.)

(2) The necessity for providing additional make up water due to (1).

(3) A loss due to the fluctuation in the rate of returning feed water to the boiler

That these several losses greatly impair the overall efficiency of the boiler plant and the process plant when considered as a whole, is shown in the calculations to follow First, however, refer to Figure 2, which diagram clearly shows the layout of a closed circuit, accelerated system In this system it will be seen that —

(1) The collecting main for the condensate, being part of the circuit, prevents all loss due to evaporation

(2) As the pump only returns that which is used, the water level in the boiler remains constant

(3) The simplicity of the system reduces prime cost and maintenance work

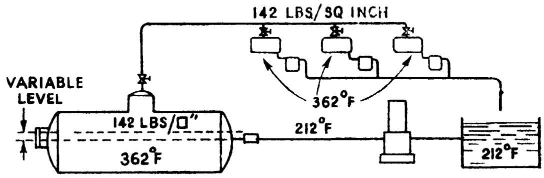
A comparison between the two systems is shown in the following calculations which are based on the use of steam generated at a pressure of 142 lb. sq. inch

(1) LOSS DUE TO DIFFERENCE OF FEED WATER TEMPERATURE

Steam temperature at 142 lb /sq in effective boiler pressure	= 362°F
Total heat of steam at 142 lb /sq in effective boiler pressure	= 1 210 B T U /lb
B T U per lb of water	= 1 210 – 182
	1 028 (Fig 1)
B T U per lb of water	= 1,210 – 333
	= 877 (Fig 2)
Difference 1 028 – 877	= 151 B T U
	= 14 9 which is a total loss in the plant layout shown in Fig 1

(2) LOSS BY EVAPORATION

Total heat of water at 212°F	= 180 B T U /lb
Latent heat of evaporation	= 980
Total heat of steam	1 160
Temperature of water in boiler at 142 lb /sq in	333°F
Loss is $\frac{151}{980}$	0 155 lb /lb of steam
Loss per cent	15 3



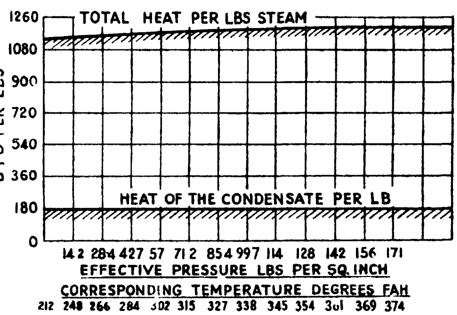


Fig 1 The vertical ordinates corresponding with the different pressures of the hatched surface represent the B T U per lb of steam with feed pump and condensate hot well

Heat required to replace this loss 0 155 × 180	= 27 B T U /lb
Therefore 333 – 27	306 B T U /lb
and 0 155 lbs will require 306 × 0 155	= 47 B T U /lb

(3) TOTAL SAVING IN CLOSED CIRCUIT SYSTEMS

Due to temperature	151 B T U /lb
Due to evaporation	47 ,,
Total saving 151 + 47	198
Total saving per cent	

$$= \frac{\text{B T U saved}}{\text{B T U produced}} = \frac{198}{1\ 028} \quad 19\ 4$$

The actual economy is considerably

greater than the calculated saving shown above, since:—

(1) The temperature of water in the hot well is always below 212° F.

(2) The water level in the boiler is constant.

(3) The loss occasioned by the use of steam traps is eliminated.

(4) The boilers operate at constant temperature.

Practical tests have shown that the actual economy effected is from 50 per cent to 100 per cent more than the theoretical figures shown above. For instance, on a plant operating at 100 lb./sq. inch, the actual saving was 32 per cent against the theoretical 15 per cent.

The successful operation of the closed circuit accelerated system is dependent upon a pump having the following features:—

(1) It must be positively self-priming.

(2) It must handle any mixture of steam and water.

(3) It must run without passing any condensate.

(4) It must immediately deliver condensate after running idle.

(5) It must operate at high temperatures.

In order to set out the principles of the two systems in the simplest possible manner, all variations of layout and uses of the steam have been neglected. As an example, it frequently happens that process steam is used at lower pressure than the boiler pressure, or a series of varying pressures are used in different units. Such variations to the general principles, however, can be dealt with.

The use of the closed circuit accelerated system is not confined to new installations. It will often be found that the change-over is quite simple, as can be seen in Figure 3.

Editor's note: The above article and all the illustrations were supplied by Ryaland (M/CR) Ltd., Hulme, Manchester.

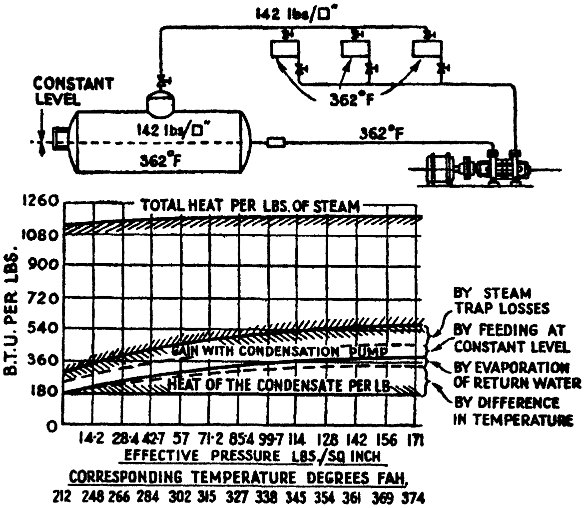


Fig. II: The vertical ordinates corresponding with the different pressures of the hatched surface represents B.T.U. per lb. of steam with same exchange as in Fig. I but with closed circuit

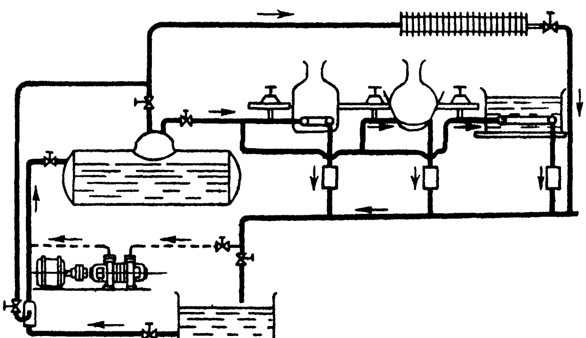


Fig. III: The above sketch shows a general installation comprising hot water tanks, evaporating and heating cisterns. The steam is distributed in tubes, steam jacketed tanks, or heat exchanger. The steam traps and conduits lead the condensation water to the tank, from which it is pumped to the boiler. By the installation of a special condensate pump economies of combustible of approximately 15-40 per cent can be attained and a saving of time in the manufacture is realised by the forced circulation. The conversion of existing installations present no difficulties. It suffices as shown in the above sketch to place a special condensation pump in the return line without changing the previous installation

AMERICAN CHEMICAL NOTEBOOK * *

A NEW cloud chamber designed to permit observation continuously instead of intermittently for fractions of a second as previously, is now being used at the Brookhaven National Laboratory, Upton, New York.

In the new chamber, vapour is continuously diffused from a warm upper surface through air or another gas to a cold lower surface. At one stage between the two surfaces the vapour becomes sufficiently cool to produce supersaturation.

The device, which is simple to make and operate, was described at a recent meeting of the American Physical Society in Chicago by four Brookhaven scientists, Drs. E. C. Fowler, D. H. Miller, R. P. Shutt and A. M. Thorndike. It is particularly useful in studying interactions caused by beams of particles from cylotrons and other high energy machines.

* * *

A NEW $10 million potash refinery and mining shaft will be erected in the Carsbad, New Mexico, area by the Southwest Potash Corporation, a subsidiary of the American Metal Company, Ltd., New York. The new plant will be in operation by the end of 1951 and will increase the area's potash output by 185,000 tons annually. Southwest Potash is the fifth company to undertake operations in the area.

* * *

SHORTAGES of phenol are expected to be considerably alleviated when the new plant of the Bakelite Division of the Union Carbide and Carbon Corporation comes into operation at Marietta, Ohio, in the middle of next year. Whether the annual rated capacity of 60 million lb. can be attained will, however, be dependent on the supplies of benzene available.

* * *

FIBRE V, the British-developed textile fibre known in Great Britain as Terylene, is to be produced in the U.S.A. by E. I. du Pont de Nemours & Co., Inc. The first commercial plant is to be constructed on a 635-acre site at Kinston, South Carolina, originally purchased for a nylon plant. Du Pont officials stated that the new use of the site had been decided upon as extensive market studies indicated that Fibre V should be commercially produced as soon as possible. Design of the plant is under way and building is expected to begin sometime next year. Quantities of both continuous filament yarn and staple required for development work of Fibre V are at present being made in an experimental operation at the Seaford plant.

SYNTHETIC glycerin production is to be increased by the Shell Chemical Company, which initiated the manufacture of the substitute at its plant in Houston, Texas, two years ago. When additional facilities come into operation before the end of next year, output of synthetic glycerin rated at some 35 million lb. annually, is expected to be raised to 50 million lb. One of the reasons cited by Shell officials for the increasing shortage of glycerin has been the reduced production of by-product glycerin from soap manufacture due to a greater use of synthetic detergents. Furthermore, a general decline in glycerin supplies has resulted from increased use of the chemical to meet both civilian and defence requirements.

* * *

A URANIUM ore refinery costing $10 million is to be erected by the United States Government. A contract for design and engineering of the new refinery, which will be erected at an undisclosed location, has been awarded by the U.S. Atomic Energy Commission to the Catalytic Construction Company of Philadelphia, which is a subsidiary of the Houdry Process Corporation. Work under the contract will be accomplished in two phases: (1) a study of existing research and development work on uranium refining processes and the development of a preliminary engineering report; and (2) final selection of a process and detailed design and engineering of the refinery.

Aluminium from Canada

A NEW long-term pact with the Aluminium Company of Canada, Ltd., was announced by the Ministry of Supply on 18 December following the statement by the Parliamentary Secretary on 16 December.

Arrangements have been made for the supply of 50,000 metric tons of aluminium in addition to the 150,000 metric tons already contracted for in 1951. A further 220,000 metric tons will also be supplied each year, in 1952 and 1953.

The British Government have agreed to fund afresh over 20 years the loans made to the company during the war to finance the expansion in Canada, and to make a new loan to the company of $25 million towards the financing of further expansion. The company will give the U.K. a first call on 200,000 metric tons a year of its production for 20 years.

IMPORTANCE OF METAL PRE-TREATMENT

SATISFACTORY progress of a British method of metal pre-treatment in a period of only five years was demonstrated to members of the Trade Press at a conference held in London on 15 December.

The occasion was part of the annual sales conference of Jenolite, Ltd., and besides the chairman's report, practical examples were able to be examined of the Jenolizing process.

Introducing the managing director, Mr. R. C. Liebman, P.R.O., said that £150 million was spent every year in this country alone on fighting rust and corrosion. Jenolite was playing its part in helping to reduce this enormous expenditure. He went on to appeal to his audience not to regard the P.R.O. as "a cumbersome barrier" and not to be too impatient. There were sometimes difficulties in dissemination of news for security or other reasons.

Technical Information Offered

Complaints had been made that some handouts were not sufficiently technical—to that he could only reply—ask, and you shall be given. Jenolite chemists, research staff and technical experts were only too willing to help and members of the Trade Press were welcome any time to watch for themselves various processes or to visit laboratories.

It should be borne in mind that the P.R.O.s lot was not so simple when dealing with the National dailies. Mr. Liebman quoted the instance of a woman's page editress who queried whether the claims made for rust removed by Jenolite were justified. After giving her every assurance she was sent a sample bottle for trial.

After a few days the editress again rang him up to say she was "most disappointed," she had been rinsing her handkerchiefs for three days and they were still rust-spotted.

Mr. J. H. Lawrence, managing director, then made his report, and welcomed the opportunity for his representatives and the Press to become better acquainted. Every representative, he said, had to have a knowledge of engineering and all metal pre-treatment processes before he went out on the road.

Each man was recalled at regular intervals to be sent to the research laboratories for a refresher course during which he was made thoroughly familiar with any new products and processes.

In the five years since its inception Jenolising, competing with long-established methods, had successfully broken in to the metal pre-treatment field.

The company had been pioneers in introducing to the small manufacturer a process which had formerly been beyond his means. It had helped to make manufacturers in almost every industry metal pre-treatment minded, and by giving British goods a better finish had enabled them to stand up against American competition.

The past 12 months had been some of the busiest since the end of the war.

Export trade had been extended to very nearly every part of the globe and one of the finest items of news about achievements abroad has occurred only two days ago, when a representative in the United States, Mr. C. R. Osborn, arrived by air from California. He brought with him the news that one of the largest American building construction schemes, the Metropolitan Housing Unit of San Francisco had specified the use of Jenolite for the treatment of all steel structures and fittings.

This was indeed good hearing for it showed that even in the U.S.A., where they thought they were leading the world in the field of metal pre-treatment, a British product, had American ideas beaten.

Process Gaining Popularity

In other parts of the world too, particularly in Denmark, the process was being increasingly applied. At home the War Office, which had already subjected it to many severe tests in official government laboratories, had established that it was equal to and more economical than galvanising or electro-zinc plating. To make Jenolite more easily available to Scottish users, Jenolite (Scotland) Ltd. had been established in Glasgow earlier in the year.

The range of products and services had been extended. An aluminium degreaser and cleaner had been added to the stock list, in reply to an insistent demand for a degreaser which would not attack the metal surface. Decarbonising solution and paint stripper were being increasingly used in the motor repair and other industries.

Another successful product was the Jenolite chemical sealer which dispensed with expensive primers such as red oxide and red lead, normally used. This could be supplied for brushing, spraying or dipping application.

AMERICAN CHEMICAL ENGINEERS

Discuss New Developments at Annual Meeting

From our New York Correspondent

IMPORTANT new developments of interest to processing and manufacturing industries highlighted the proceedings of the 43rd annual meeting of the American Institute of Chemical Engineers, which took place in Columbus, Ohio, 3 to 6 December. Thomas H. Chilton, technical director of the development engineering division of E. I. du Pont de Nemours & Co., Inc., was elected president for 1951.

Reporting on recent work of atomic energy scientists, W. K. Eister and W. G. Stockdale, of the Oak Ridge National Laboratory, Oak Ridge, Tennessee, told the chemical engineers that decontamination techniques have been perfected that successfully eliminate the possibility of atmosphere pollution by radioactive airborne wastes from atomic reactors. They said that two methods could be used to eliminate radioactive washes, filtration and absorption. Since the great majority of the radioactive wastes were normally present as a fine dust, filtration techniques had been developed which reduce radioactivity to the level normally present in the atmosphere. "For those few radioisotopes which are true gases," they said, "more complex absorption procedures are required."

The cost of both techniques was high, they said, and the present trend had been to reduce the volume of air that might become contaminated. "The radioactivity that is removed from the air," it was revealed, "must be permanently stored, as it will be years, in most cases, before the radioisotopes have decayed to their stable products. In some cases, however, where work with short-lived radioisotopes is carried out, storage for about one hundred days is all that would be required."

Continuous Cold Rubber Process

Mr. M. W. Larson of the B. F. Goodrich Chemical Company, Cleveland, Ohio, described a continuous cold rubber process. Cold rubber was until recently produced by a batch method involving a 16-hour mixing period, but Mr. Larson told how Goodrich chemical engineers successfully overcame the obstacles in their path to convert the Goodrich-operated U.S. Reconstruction Finance Corporation plant at Port Neches, Texas, from batch operation to a continuous process. The new system permits continuous feeding of ingredients and results in a steady stream of liquid rubber latex. The conversion increased the capacity of the plant by about 20 per cent, lowered production costs, improved product quality, and resulted in better process and plant control. According to Mr. Larson, over 65,000,000 pounds of cold rubber have been produced by this process.

A new process for the manufacture of toluene and benzene, was described by Dr. Lloyd Berg and co-workers of Montana State College, Bozeman, Montana. A catalyst consisting of alumina pellets treated with hydrogen fluoride, which "triggers" the wanted reactions, was used they said. The shortage of important materials for explosives and synthetic rubber manufacture might be alleviated by the new catalytic process which converts certain aromatic hydrocarbons that are abundant in some petroleum oils into either toluene or benzene, they added.

Producing High Octane Petrol

Complex compounds in gaseous form when passed over the alumina pellets at high temperature were stripped of the undesirable constituent. The resulting products were distilled, yielding the benze and toluene fractions. Eventual production in fluidising units was predicted. Equipment of this type, it was pointed out, is now in use in the United States for manufacturing large volumes of high octane gasoline.

The barrier to the use of ultrasonic energy in industrial processes has been overcome by a new technique developed by the Brush Development Company in building a pilot plant two kilowatt ultrasonic generator. According to John W. Butterworth, director of Hypersonics at the Brush Company, generators of unlimited power can be built as a result of the development of a ceramic material which gives off high frequency, high intensity sound waves when excited electrically.

Some of the unique effects of ultrasonic energy have been known for nearly 30 years but have been limited in their industrial applications by a lack of necessary power. One application of these effects is in the killing of bacteria in vaccines and other pharmaceutical products. This method promises to be superior to sterilisation processes using either heat or chemicals. For example,

penicillin would have its effectiveness reduced greatly if it were sterilised by heating. Since it is frequently injected into the human blood stream, it is very difficult to add a chemical which would kill the bacteria and still not be harmful to the human body. Another use of sonic energy is in preparing emulsions of liquids or liquids and solids in order to prevent settling or separation. An instance of this application is the irradiation of paint by ultrasonic energy. When this is done, the pigment, or colouring matter, in the paint no longer settles out from the oil vehicle.

Experimental Model

While the Brush generator is an experimental model for pilot plant operations, it demonstrates that units of almost unlimited size can be constructed. Mr. Butterworth reported that the chemical field offers excellent potentialities for ultrasonic applications.

A study of the drying of single drops under varying conditions was described by W. E. Ranz and W. R. Marshall, Jr., of the University of Wisconsin. With the aid of microscopes and a motion picture camera, they obtained information on how a dry particle is formed during the drying of a single drop which initially contained the particle in dissolved or dispersed form.

Counting and measuring drops, a truly Herculean task, was described by Marshall, C. R. Adler, and two associates, all of the University of Wisconsin. They reported how they eliminated the tedious visual examination of photographs of sprays for drop number and size, by designing and operating an electronic drop and size analyser. The device, containing 160 electronic tubes and many lights and switches, scans photographs of sprays with a light beam. Electric pulses produced are sorted into size classes and counted, giving the number of drops of each size. Doing a 12-man-hour job of photographic scanning in ten minutes, the machine promises to have wide use in spray-drying research.

No Customs Duty

EXEMPTION from Customs duty of imports of books, newspapers, periodicals for advance in the education, scientific and cultural fields was the object of the Unesco agreement signed last month, said the President of the Board of Trade in a written answer. Scientific instruments of a type not produced in the importing country were also included. Arrangements were being made for the text to be published as a White Paper.

AMERICAN CHEMICAL ENGINEERS

New Officers Elected

THE American Institute of Chemical Engineers held its 43rd annual meeting at Columbus, Ohio, from 3-6 December. The institute, which is the professional organisation for chemical engineers in the U.S.A., was founded in 1908 and now has a membership of well over 10,000.

Mr. Thomas H. Chilton, technical director of the development engineering division of E. I. Du Pont de Nemours & Co., was elected president for 1951. He has been with the company since 1925 when he began in process development and unit operations research for the chemical department.

Elected by Post

A new vice-president, Mr. William I. Burt, was elected through a mail ballot of members. A vice-president of the B. F. Goodrich Chemical Co., he has twice been a director of the A.I.Ch.E. for three-year terms and has been chairman of many committees in the chemical engineering profession.

Four new directors were chosen as follows:—Mr. Charles R. Nelson, manager of the process engineering department of the Shell Development Co.; Mr. Earl P. Stevenson, president of Arthur D. Little, Inc., and a consultant to the Atomic Energy Commission and the Department of Department of Defence and Chemical Corps.; Mr. R. C. Gunness, manager of research of the Standard Oil Co., who has done much original work in distillation and heat transfer; Mr. R. Paul Kite, manager of the development lepartment of The Dorr Co., who is noted for his work on sedimentation and studies of pollution abatement.

The Junior Award of the institute was presented to Professor F. M. Tiller, associate professor of chemical engineering at Vanderbilt University, Nashville, Tenn. The honour is given for outstanding contributions to the literature of chemical engineering.

The professor was chosen for his paper on "Efficiencies in Gas Absorption, Extraction, and Washing," published in the magazine Chemical Engineering Progress in 1949.

Work Well-known

Professor Tiller has published numerous technical articles in chemical engineering literature and is known for his work in infra-red radiation and gas absorption. His industrial experience included a term as chemist with Colgate-Palmolive Peet.

NEW FUNGICIDES FOR LEATHER

From A SPECIAL CORRESPONDENT

THE importance of the fungicidal treatment of leather is now fully recognised and experiences in Korea have shown that nothing degrades leather footwear and equipment as quickly as fungi. Full realisation of the value of fungicidal treatment is found in the recent decision of the American Government that in future all military leathers would be required to contain three-tenths of 1 per cent of para-nitrophenol. This chemical is, of course, only one of the many mould preventatives which have been used with considerable success to make leather and also many other materials unfavourable for the growth of fungi. To list all the fungicides which have been employed from time to time for the treatment of leather would take up too much space. It is proposed, therefore, to describe some of the most recently introduced and interesting of these chemicals and to discuss their advantages and disadvantages.

Para-nitrophenol or para-hydroxynitrobenzene is available commercially as a brown granular mass having a melting point of 112° C. In its pure form it is a yellow crystalline chemical having a melting point 113-4. Para-nitrophenol is very soluble in hot water and soluble in alcohol, ether and many other solvents. It is toxic and must not come in contact with the skin and its dust or vapour must not be breathed. One of the reasons why p-nitrophenol is recommended is that it is freely soluble in sulphonated oils and many oleaginous mixtures used in tanning; soluble in tanning solutions and can also be dissolved in solvents, such as cyclohexanone which is used in some formulations recommended for spraying finished leathers. The main disadvantage of p-nitrophenol is that it is soluble in water and therefore easy to leach out of the leather, either during processing or when made up into footwear or equipment.

Copper 8-quinolinolate

An interesting non-soluble fungicide is copper 8-quinolinolate which is a yellowish-green powder, practically odourless and insoluble in water and organic solvents. This chemical is very stable, non-hygroscopic and possesses strong fungistatic properties. It is relatively non-toxic to higher animals. To facilitate application of this copper compound the preservative is available in the form of a 10 per cent water dispersible paste concentrate and a 20 per cent oil dispersible paste concentrate. An interesting new development is the use of copper 8-quinolinolate in an aerosol preparation containing oils suitable for the prevention of embrittlement in leathers and protection against rot and decay due to mould growth.

Copper Naphthenate

Another copper compound of great value as a fungicide is copper naphthenate. This is a soft, greenish resin soluble in all the common solvents but insoluble in water. It has a slight staining effect on leather and tends to leave the surface somewhat sticky if applied as a surface coating. If incorporated in the fat-liquor in proportions of about 1 per cent it gives excellent protection to both upper leather and sole leather. Not only does the copper itself contribute valuable fungicidal properties, but the presence of the naphthenic radical is also important in this respect.

Para-chloro-meta-cresol and para-chloro-meta-xylenol are used as industrial preservatives against mould and mildew and as auxiliary germicides in the manufacture of antiseptic and disinfectant fluids. They are white transparent crystals having a sharp but not unpleasant smell and soluble in a number of common solvents. Tetrachlorohydroquinone is another organic chemical which has been proved useful in controlling the growth of moulds in leather. Unfortunately, it is not readily miscible with sulphonated oils, fish oils and oleaginous mixtures and cannot easily be employed in fat-liquoring or "chamoising." Tetrachlorohydroquinone dissolves in a number of common solvents, including cyclohexanone, and can be used in spray formulae containing this solvent.

Sodium pentachlorophenate is now widely employed as a fungicide and preservative. In its commercial form this chemical has a distinct chlorophenolic smell and it is toxic to man and the higher animals. The commercial form of sodium pentachlorophenate is a dark, greyish flaky substance having a crystallising point 174° C. It is relatively non-hygroscopic and unreactive chemically; soluble in various degrees in organic solvents but relatively insoluble in water. One disadvantage of this fungicide is that its solutions may be irritating to the skin and therefore care needs to be taken in handling leather goods treated with pentachlorophenate preparations. Ortho and

para-benzylphenol are other fungicides of interest to the leather industry.

Para-dichlorobenzene, a chemical used very extensively to control the clothes moth, has also been successfully employed to prevent mildewing of stored leather. It is necessary that a saturated atmosphere of para-vapour be maintained in a storage compartment by replenishing the chemical as it is dissipated. Tests carried out by Monsanto Chemical Company have shown that an enclosed space of about 100 cu. ft., relatively air tight, was completely protected for two years using 1 lb. of para-dichlorobenzene during the hot months and about 1 lb. for the entire winter season.

Another interesting development in fungicides is the use of phenyl-mercuric compounds. After drying, these chemicals are irreversibly fixed to the leather and concentrations up to 5 per cent are not irritating to the skin.

The main requirements of a satisfactory fungicide for leather can be summarised as follows:—

1. It must be an effective fungicide when present in proportions not exceeding 0.3-0.5 per cent.

2. It must have no harmful effect on the skin and be non-toxic when its vapour or fumes are breathed.

3. The fungicide should not leach out readily from the leather when it is exposed to the weather.

4 The fungicide must not be corrosive in its action on metals, *e.g.*, one of the main disadvantages of the pentachlorophenols in that they attack metals.

5. It should be free from any distinctive or unpleasant smell and have no staining effect on delicately coloured leathers.

6. It should be convenient to use, *i.e.*, readily soluble in tanning oils and those solvents normally handled in a leather works.

FOOD TECHNOLOGY

National College for London

A NATIONAL College of Food Technology is to be established in London about September of next year. This decision was made after negotiations between the Ministry of Education, the Ministry of Food, and representatives of various sections of the food industry.

A board of governors has recently been appointed by the Minister of Education on the nomination of the interests concerned with Mr. Frank Shires, of the Food Manufacturers' Federation, as chairman. Dr. John Hammond, F.R.S., of the School of Agriculture, Cambridge University, has been appointed vice-chairman.

The college will provide the different sections of the food industry with training at a high level. This will include the handling, preservation, and processing of meat, fish, and other foods, together with their various derivatives and by-products; it will also deal with those branches of science most closely concerned with changes which take place in food during preservation and processing.

As a good foundation of science coupled with industrial experience is required students will be drawn from industry at a comparatively late age of 23 or over. Attendance will be on a full-time basis.

The college will at first be housed within the premises of the Smithfield Technical College and some nearby premises which have been adapted. Plans, however, are being made to acquire new premises soon.

Poison Act to be Amended

STATUTORY Instruments giving effect to recommendations made to the Secretary of State by the Poisons Board are being prepared. Changes in the Poisons List and in the schedules to the Poisons Rules are proposed as follows:—

1. *Organic compounds of Mercury.*—Organic compounds of mercury containing a methyl (CH_3) group linked to the mercury atom will be excepted from the fifth schedule.

2. *Para tertiary amyl phenol.*—This substance will be added to the entry in column 2 of Group II of the third schedule relating to phenols.

3. *Procaine penicillin.*—Procaine, when in preparations to which the Penicillin Act, 1947, applies, will be exempted from the first schedule.

4. *Anti-histamine substances.*—To the definition of anti-histamine substances given in Part I of the Poisons List and in the first, third and fourth schedules there will be added chlorcyclizine and promethazine.

5. *Flaxedil.*—This substance under the name "gallamine," which has been approved by the British Pharmacopoeia Commission, will be added to Part I of the Poisons List and to the first and fourth schedules.

6. *Paradione.*—This substance, under a name to be approved by the British Pharmacopoeia Commission, will be added to Part I of the Poisons List and to the first and fourth schedules.

PHYSICAL METHODS OF FOOD ANALYSIS

The subject of the second meeting held recently in Birmingham of the Midlands Analytical Methods Discussion Group was "Physical Methods of General Food Analysis." It was introduced by Dr. H. E. Cox. Following is an exclusive summary of the opinions expressed during the meeting.

PHYSICAL, or physico-chemical, methods of analysis depend essentially on the use of instruments, since the methods are based primarily on the measurement of some physical quantity. The instrument is becoming more and more indispensable to the analytical chemist and, in particular, to the food analyst. Thus, the methods of absorptiometry, flame photometry, emission spectroscopy and spectrography, to mention only a few, are applied in most modern laboratories despite the high cost of equipment. The comparatively new science of chromatography, especially paper chromatography, has proved invaluable to the analyst.

There is no doubt that the value of physical methods must be assessed in relation to the particular problem under investigation. The errors obtained in a determination by means of instruments are sometimes considerable compared with chemical assay. Hence, it is necessary to maintain a sense of proportion—for routine control, where a large number of analyses are required within a short time, physical methods are generally superior, but, where accuracy is wanted, probably chemical methods of analysis are more desirable.

Speed of Great Value

The great value, then, of physical methods lies in their speed, particularly in routine control analysis. For example, a flame photometric method for the determination of the alkali metals in foodstuffs will give results of a high order of accuracy in a few minutes, compared with the one to two days required by normal macro-chemical methods. Again, emission spectroscopical techniques, while not yielding accurate quantitative results, will give a complete qualitative analysis of the material and an approximate quantitative analysis; with this important preliminary knowledge, the analyst can decide which methods are the most suitable for the elements sought.

It must not be forgotten, however, in this era of instrumentation, that behind these rapid, 'push-button' methods of analyses there is always a standardisation which depends on a knowledge of real chemical analysis. The instrument must be used as a tool as is the balance, but it is important to understand the chemistry of the process going on within the instrument.

Colorimetry Most Common

Probably the most commonly used physical method in food analysis is colorimetry. Within recent years, many new organic reagents have been developed which give colours of high intensity with many metal ions. In fact, most metals have been determined by virtue of the colours they produce with certain organic reagents. At the present time, the well-known Hilger Photoelectric Absorptiometer ("Spekker") has superseded the older types of colorimeter (Nessler tube, Tintometer, Dubosq colorimeter, etc.) where the judgment and the colour vision of the analyst are the critical factors in the analysis. As these older methods are, in the main, comparison procedures, the advent of the photoelectric instrument has been a boon to the analyst from the point of view of both speed and accuracy. Further, the newer procedures eliminate eyestrain and contribute to the well-being of the analyst.

Even such an instrument as the "Spekker" can behave capriciously at times, and certain definite procedures have to be adhered to during an analysis. For example, the manner of placing the cells in the holder is of importance. It has occasionally been found that by the mere reversal of the cell in its holder a different drum reading is obtained. Again, cleanliness of the cells is essential, while variations in the lamp often cause trouble.

Some workers regard it as a decided danger to rely too much on previously determined calibration curves, and prefer to run standards along with the actual determination.

The precision of measuring colour intensity by the modern instruments is often greater than the precision of the chromogenicity of the reaction, and this must be taken into account when stating the accuracy of the results.

Although the cost of apparatus should be a secondary consideration, the necessarily high cost of the "Spekker" has meant that some of the smaller laboratories have had to make do with less expensive and less versatile instruments. A wide variety of cheaper instruments, costing in the neighbourhood of £20 is available commercially. Only one type of cell,

however, is used with these instruments which generally suffer from a lack of sensitivity. The filters supplied have too wide transmission bands. However, instruments of this type are quite useful.

A direct reading photoelectric absorptiometer, as versatile and accurate as the "Spekker" has been constructed in the laboratory for less than £40 (Boots Pure Drug Co. Ltd., Nottingham). It can be used with the Ilford range of narrow band pass filters, and standard cuvettes up to 4 cm. can be employed. It is direct reading in either Percentage Transmission or Optical Density, mains operated, and is very simple to use. The light supply is a motor car headlamp bulb of about 24 watts at 6 volts. This is supplied from the mains through a constant voltage transformer. Parallel or slightly converging light is obtained by means of a cheap lens of about 2 in. focal length, and this light is passed through a mask to obtain a beam of about ¾ in. square, cross section. On the mask, is fixed a heat absorbing filter and a sprung shutter which remains closed when not being operated.

Mounted in Perspex Holder

The cuvettes containing the solution and blank are mounted in a perspex holder on a simple slide so that they can be interchanged easily and quickly.

The filters, which are situated between the cuvettes and the photocell, are mounted on a rotating disc which projects through the side of the case for turning. A positive positioning device consists of a small sprung ball-bearing, which catches into a depression cut into the disc near the outside edge. By this means, the filters are very easily and quickly interchanged, an added advantage being that they are never handled, it being merely necessary to turn the disc to the appropriate filter number.

The photocell is a 45 mm. diameter circular "Eel" cell the output of which is fed into a galvanometer through an Ayrton Shunt consisting of a 10,000 ohm helical potentiometer.

The whole instrument, not including constant voltage transformer or galvanometer, is contained in a box 8 in. × 9 in. × 9 in. The light source is separated from the rest by a partition, so that no light can reach the photocell unless the shutter is operated.

The galvanometer gives full scale deflection with about 2 μ amps input and has a scale graduated 0 to 100 which can be used directly as per cent transmission. Current models have an additional optical density scale.

In operation, the filter is selected and, with the *Blank* cuvette in position, the shutter is operated and the helipot adjusted to give a reading 100 per cent T (or Zero density) on the galvanometer. The cuvettes are interchanged and the shutter opened again when per cent T or D is read off directly.

It has been shown recently that certain metals in combination with the well-known compound B.A.L. (British Anti-Lewisite) can be estimated absorptiometrically. The colourless complexes may be determined on an ordinary "Spekker" using the shortest wavelength filter to measure the maximum absorption, that it, using U.V. wavelengths.

Balance Developments

The chemical balance is, of course, still one of the main tools of the analytical chemist, and there have been many striking developments in balance manufacture within recent years. Several laboratories have now installed completely automatic balances which more than pay for themselves in the matter of a year or two by means of time saved in weighing. The integrating type of fully automatic balance is as yet unknown in the country, but there is undoubtedly a case to be made out for its introduction.

Chromatographic methods are proving invaluable to the analystical chemist, and are of special importance to the food chemist. Some workers have questioned the methods for the selection of solvents for these techniques and feel there is too much empiricism involved. However, it has been shown in numerous publications that solvents are not always selected at random, and that, in many cases, the best solvent or solvents for a particular separation can be logically selected.

A Common Fallacy

It is a common fallacy that column chromatography is the adsorption type, while paper chromatography is the partition type. Certain types of column chromatography, however, are of the partition type; for example, the separation of amino acids on a silica gel column.

The preparation of samples prior to the estimation of trace metals, etc., in foodstuffs, generally involves an ashing process. The need for extreme care during this process must be emphasised, as losses of metal both by volatilisation and fusion to the dish are common. If ashing is carried out in the presence of phosphate, alkalisation is essential, since losses of chloride and sulphate may be incurred in the presence of acid phosphate.

THE NICKEL INDUSTRY IN 1950

Canadian Output Peace Time Record

"DESPITE the fact that nickel was in tight supply during the latter half of this year, the amount available for distribution and Governmental stockpiling in 1950 was the largest for any peace time year in the history of the Canadian nickel industry." This was stated by Dr. John F. Thompson, president of the International Nickel Company of Canada, in a review of the nickel industry, in Ontario, on 14 December.

"It is expected," continued Dr. Thompson, "that nickel output by the Canadian producers, International and Falconbridge Nickel Mines, Ltd., for the year 1950, will approximate 250 million lb. Currently, International Nickel's production is running at substantially the average level of the war years.

"In the latter part of June, prior to the Korean conflict, when it became apparent that the demand for nickel would exceed the available supply, a voluntary rationing programme was put into effect. Although nickel, like other metals, remains in tight supply, military requirements are being met in full and shipments are being made to Government stockpiles. The trade's civilian requirements continue, however, to take the major portion of the world's supply.

"In the United States on 2 December an order was issued by the National Production Authority limiting the non-military consumption of nickel in the first quarter of 1951 to 65 per cent of the average quarterly rate of consumption during the base period comprising the first six months of 1950. The order is stated to be designed to maintain equitable distribution, through normal channels, of that amount of primary nickel remaining after meeting the requirements of the national defence.

Maintained at Capacity

"International Nickel's production of nickel for the past six months has been maintained at maximum capacity. This has only been possible through a development and expansion programme, to provide greatly increased underground ore facilities to replace open pit ore, depleted during the war. The broad mining development and expansion programme has entailed expenditures in recent years of some $90 million, of which over $40 million have been spent since the end of the war. This programme will require further large capital expenditures during the next several years to permit maintenance of current capacity production of nickel as the end of supplies from the Frood-Stobie open pits approaches.

"Canada, the world's predominant producer of nickel since the early part of this century, continued to furnish the industrial world with the major portion of its requirements. This year's nickel output of the French New Caledonian deposits is reported to have been sufficient to meet the requirements of French industry. No information is available on Russia's 1950 production of nickel. In September it was reported that the United States Government was planning to reactivate its idle nickel facilities at Nicaro, Cuba, which were closed early in 1947. The production of this plant for the preceding year, 1946, was reported at approximately 25 million pounds.

Major Increases in Costs

"In the second quarter of the year major increases in costs for refined nickel required International Nickel to raise its United States base price of electrolytic nickel to 48 cents per lb., including the United States import duty Prices in other markets were adjusted correspondingly. The increase brought the price of nickel to a level about 40 per cent above the average price prevailing for all markets in the prewar years.

"The steel industry of the world, as in past years, again accounted for the largest portion of the nickel consumed in 1950 and the demand by this industry was appreciably above that of last year. The proportion of nickel-containing grades to the total production of engineering alloy steels did not appreciably alter during the year, although in the latter months some reshuffling between individual grades was necessary.

"Nickel alloy steels, including those containing chromium and molybdenum, were employed in large tonnages during the year. These steels find applications in essential constituent parts, such as shafting, gears, structural tubing and heavy springs, for the aircraft, automotive, agricultural machinery, machine tool, mining, petroleum, railroad and other industries.

"The advantages in resistance to corrosion and abrasion of the low alloy high strength steels, containing up to 2 per cent nickel, for the construction of railroad freight cars—especially in coal and ore service—have become well recognised.

"In hydro-electric plants in Great

Britain, nickel-chromium steel is being used for rollers, axles and other components of reservoir control gates. The machine tool industries of the United Kingdom, Germany and Switzerland are requiring larger amounts of nickel alloy steels to meet the exacting demands for high strength, toughness and general reliability in the world-wide demand for up-to-date equipment.

"The rapid strides that have been made in low temperature processing and the growing interest in bulk storage of liquefied gases resulted in an increased use of the straight nickel steels during the early part of the year. Low carbon 2.5 per cent nickel and low carbon 3.5 per cent nickel steels are now standard grades for temperatures of minus 20°F. to minus 150°F., and low carbon 9 per cent nickel steel is being used for temperatures as low as that of liquid nitrogen.

"British agriculture, with a higher percentage of its farmed acreage mechanised than that of any other country, is creating an increasing demand for nickel alloy steels for shafts, gears and other highly stressed components of tractors and of other mechanical equipment. The tractor industry in the United States is also expanding its consumption of nickel alloy steels.

"The use of nickel in alloy steel electrodes for metal arc welding has increased rapidly since the introduction of the lime-ferritic type of electrode coatings. These nickel steel electrodes are used widely in welding of railroad equipment, trucks, crushers, and both cast and wrought parts for heavy machinery. They are also standard for welding steels intended for low temperature service.

Stainless Steels

"During the first nine months of 1950 the production of stainless steels in the United States was the largest of any similar period in the history of the steel industry. The average quarterly production was in excess of 195,000 tons. Indications are that the output for the full year may approach 750,000 tons. Over 60 per cent of this production is expected to be nickel-containing grades, which will account for a large portion of the steel industry's nickel consumption.

"The chemical and petroleum industries remained the largest outlet for stainless steels in Western Europe. New oil refineries in Great Britain have taken large tonnages. In India, the world's largest sulphate of ammonia plant, now under construction, has required substantial quantities of stainless steels.

"In Western Europe production facilities have been taxed to the limit and striking evidence of sustained interest in steels of the 18-8 chromium-nickel type has been given by displays at leading industrial fairs. Chemical equipment of stainless steel was the predominant feature of the first post-war chemical plant exhibition in Germany.

"The extra low carbon grades of stainless steels continued to receive attention. These steels were used for welded and other equipment for which stress relieving treatments are required.

Mill and Foundry Products

"General advances in all fields of industry during the past year have been reflected in the expanding uses of malleable nickel and the "Inco" nickel alloys such as Monel and Inconel. This expansion had been noted in normal peace-time industry prior to the beginning of defence programmes.

"The chemical, processing and allied industries, as well as the so-called power and mechanical fields, as in the past, were among the larger users of these materials. Introduction by these industries of new and improved products was responsible for extension of existing applications of the "Inco" nickel alloys as well as for their introduction into new equipment, requiring high strength, resistance to corrosion, heat, wear, and combinations of these properties.

"Results of field performance and laboratory tests have confirmed the value of Inconel for such high temperature applications of those involved in the processing of natural gas.

"Further attention was directed to market potentialities for Inconel in other areas of high temperature service including the important furnace and heat treating fields. A hot-rolled Inconel 'T' section was introduced by the Huntington (West Virginia) works of International Nickel in this connection. The primary purpose of this product is to provide manufacturers of furnaces and other high temperature equipment with ready-made and uniform structural parts at considerable economy over the cost of fabricating those parts in their own shops. This section can be welded, riveted, or otherwise joined without difficulty.

"Monel was widely used for all purposes involving resistance to corrosion, wear, and to temperatures under the higher Inconel ranges. Applications ranged from motor boat shafting to laundry and chemical equipment.

"During the year, nickel, Monel, and Inconel were made available in the form of expanded metal, used largely for screens where the finer meshes are not required,

though potential applications are not limited to such purposes. Uses have been broadened to include such diversified items as laundry and chemical plant equipment, and for lathing used to anchor insulation materials in steam and other power plants.

"The unique combination of properties of 'Ni-Resist'—resistance to heat, corrosion, wear and erosion, and thermal expansion control—has become increasingly recognised in the past year in sea water and insecticide pumps and valves, engine valve guides, steam service, engine liners and glass moulds, and for piston ring lands in aluminium pistons. Wherever heavy duty machines demand this unique combination of properties, 'Ni-Resist,'' a cast iron containing nickel, is being adopted as standard. The commercial production of magnesium-containing Ductile Ni-Resist was successfully begun during the year. The improved strength and toughness of this new material, with its resistance to service deterioration, provides an economical alloy which is being favourably regarded by industry. Another new type of 'Ni-Resist,' which can be hardened after machining, is being service tested by many industries where resistance to corrosion and abrasion is required.

"Substantial quantities of 'Ni-Hard,' a white iron containing 2.5 to 4.75 per cent nickel, as well as chromium, were consumed in the form of steel mill rolls and as abrasion-resisting castings for the iron, copper and nickel mining industries and the power and ceramic fields. Grinding balls and slugs, cast in this nickel alloyed iron, found an expanding market in the cement and paint industries during the year, with reduction in the consumption rate of grinding media and reduced discoloration of the final products being important considerations.

Uses in Europe

"Engineering grades of alloy cast iron containing from 1 to 3 per cent nickel are increasingly being specified, notably in the Continental countries. Belgian foundries are supplying these irons for heavy lathe beds, large size lock-gate rollers, power station plant equipment and melting pots. Numerous parts of this material have been furnished by French foundries for hydro-electric plants in North Africa, Madagascar and other French colonies. Swedish interests are actively engaged in developing high duty nickel cast irons for automobile engine cylinder blocks and for small power units of all types.

"Ductile Iron, a product of International Nickel's research laboratories introduced early in 1949, has made good progress this year, emerging from the pilot plant stage to become an accepted engineering material. It is estimated that the output from licensed foundries for the year 1950 will be between 15,000 and 20,000 melt tons compared with 3,500 tons during 1949.

Nickel-Plating

"Nickel-plating continued its growth as one of the major nickel consuming industries. The demand for plating nickel during the first part of 1950 indicated that such use was about one-third greater than any former peak.

"While increased demand was apparent in the large field of protective coatings as represented principally by the automative industry, other newer and smaller uses showed greater relative increases.

"Utility uses of nickel-plating have increased. The use of disposable nickel-plated steel drums for the export shipment of caustic soda has been established as an economical procedure. The inside plating of steel tubing for oil wells and corrosive chemical use has gone forward in large size pilot plants and tubing is now being sold more rapidly than it can be produced. Electroforming of screens and other special shapes attained continuous production during the first half of the year. Immediate need for fabricated electroplated steel chemical engineering equipment has prompted the installation of facilities for the heavy plating of large pieces which can be utilised in the future for the extension of such business when present orders are completed.

Copper Base Alloys

"The greater output of castings, together with the undiminished use of nickel in gear bronzes, pressure castings and bearing bronzes, accounted for a larger consumption of nickel in the non-ferrous casting field during 1950. The alloyed bronzes containing 3 to 5 per cent nickel found applications for constructional and funcional purposes including valves, pumps, gears and machine frames. Nickel continued to be employed as an addition for equalising the distribution of lead in bearing bronzes and to improve their mechanical properties. More widely recognised has been the function of nickel in imparting high strength and hardness to the aluminium bronzes, as well as contributing to their corrosion-resistance. The high resistance to heat and wear of these alloys, has established their position in aircraft construction for such parts as valve guides, valve seats, rings and bushings. In Great Britain, ship's propellers up to 3½ tons in weight are now being made regularly of a 5 per cent nickel-aluminium bronze, which is stronger and gives better

service than the manganese-bronze previously used.

"Nickel silver, a copper base alloy containing nickel and zinc, continued its progress for applications in which appearance, cleanliness, colour and finish and corrosion-resistance are essential requirements. This alloy is the preferred material for use as a base metal for the production of silver-plated ware and is used extensively.

"The cupro-nickel alloys are used mainly in industrial applications where corrosion-resistance and mechanical properties of a higher order than those obtainable in nickel silver are required. The enlarged activity in the building and re-activation of both naval and merchant vessels has increased the demand for these alloys where they are employed extensively for condenser tubing and salt water lines to withstand the corrosive effects of sea water. Cupro-nickel alloys also continued to be used in the petroleum industry, for heat exchangers in the refining of sugar, in power plants and water works service, as well as for valve trim in a great number of industrial applications. The iron-modified 10 per cent cupro-nickel alloy is finding increased application as an economical condenser tube and salt water piping alloy.

Iron-Nickel Alloy Specialities

"Utilisation of the iron-nickel base alloys with special magnetic and thermal expansion characteristics for control devices and radar, electronic and communications equipment continued on a steadily expanding scale during the year. Nickel is an essential constituent of these alloys in amounts varying from 22 to 80 per cent. Similarly, the markets for the extremely strong permanent magnet alloys of the Alnico type, containing 14 per cent or more of nickel, are increasing rapidly. New applications are constantly being developed, with the field of potential applications being very broad.

"Ferrites, ceramic-like magnetic materials used in various parts of television equipment, have caused a marked increase in the demand for nickel oxide."

New Canadian Chlorine Plant

THE first sizeable chlorine plant to use De Nora mercury-type cells, with a rated capacity of 30,000 ampères, is to be built by the Marathon Paper Mills in Canada. This is the result of an agreement recently reached between the Leonard Construction Co., of Chicago, the Monsanto Chemical Co., of St. Louis, and the Marathon Paper Co. The plant is to be erected at Marathon, Ontario, and will produce 25 tons of chlorine per day. Caustic soda suitable for rayon processing, electrolytic sodium sulphide, sodium hypochlorite and hydrochloric acid will also be manufactured at the plant.

French Studying U.S. Nitrogen

A TEAM of representatives of the French nitrogen fertiliser industry has just begun a six-week study of American methods of production.

Despite substantial gains in production in the five years since the end of World War II, French output of nitrogen is still far short of requirements. To step up French production, say the ECA authorities, will require the adoption of improved production techniques and lowered costs. The French team will discuss its problems with U.S. Government officials and will study plants operating in America.

Royal Technical College Dinner

THE PIONEERING efforts in technical education leading to the establishment of the Royal Technical College, Glasgow, were praised by Dr. Idris Jones, chief of the scientific department of the National Coal Board, when he spoke at the annual dinner-dance of the London branch of the R.T.C. Former Students' Association on 13 December.

Dr. Jones said that the college had evolved as an integration of the primary efforts in the field of technical education of a number of institutions, starting with John Anderson's work in 1796.

His institution was the first in which scientific instruction was given with special reference to its practical application—the first to provide systematic evening classes in science and the first institution open to women on the same terms as men.

In it was established the first laboratory in Britain for the teaching of chemistry. Later all institutions in Glasgow were amalgamated in what later became known as the Royal Technical College.

Dr. J. G. King, director of the Gas Research Board, in replying to the toast of "The College," mentioned that Dr. W. M. Cumming, formerly professor of technical chemistry at the college, had written to say that the Former Students' Association now had 200 members.

Sir Andrew Bryan, Chief Inspector of Mines and chairman of the London branch of the association, presided at the gathering, which numbered about 60. The London branch, formed about 18 months ago, now has 150 members.

PERACETIC ACID REACTIONS

From A SPECIAL CORRESPONDENT

PERACETIC ACID reacts vigorously and exothermically with unsaturated compounds to yield oxirane (α epoxy) substances and/or α glycols, dependent upon reaction conditions. A typical epoxidation procedure is the conversion of butyl oleate into epoxy butyl stearate. This is effected by adding the peracetic acid containing sodium acetate to the distilled butyl oleate with constant stirring and maintaining a temperature not exceeding 15-20°C. After stirring for four hours the stearate is separated by pouring the solution into concentrated brine. By utilising hydroxylation procedure it is possible by the use of peracetic acid to convert oleic acid into 9:10 dihydroxystearic acid. In this case the oleic acid is dissolved in formic acid containing a small quantity of sulphuric acid to act as a catalyst. The hydrogen peroxide is added very slowly and the temperature maintained at 40°C. for three hours. The hydroxy-formoxystearic acid is saponified with sodium hydroxide and after cooling the saponified product is poured into diluted hydrochloric acid, filtered, washed and cooled.

It is known that reactions of organic peracids with unsaturated compounds are general for compounds with isolated double bonds. Electron-attracting groups, such as carboxyl, keto, aldehyde, attached to or near a double bond slow down or prevent the reaction of a peracid with the double bond. By contrast, electron-releasing groups like the alkyl, attached to or in close proximity to a double bond, increase the spread of reaction. Among the unsaturated materials with which peracids have been reacted, the following may be noted; olefins (aliphatic and alicyclic), unsaturated fatty acids and esters, unsaturated alcohols, fats and oils, terpenes, unsaturated polymers (e.g. rubber), sterols and monomers, such as styrene.

The applications of epoxy and dihydroxy compounds are very numerous, e.g., in the manufacture of polyvinyl chloride and chlorinated rubber, epoxy compounds are acid acceptors and show valuable stabilizing action: dihydroxy fatty acids are trifunctional and can be used to create new modified alkyd resins (U.S. Pat. 1,815,886).

The use of epoxy compounds has also been suggested for the manufacture of new condensation polymers and as a cross link ing agent for polymers containing active hydrogens. In U.S. Patent 2,451.173 a method is disclosed of making rubbery type polymers by polymerising dihydroxy fatty acids and epoxy fatty acids. Crowder & Elm (Ind. and Eng. Chem. 41,1771 (1949)) described methods of making synthetic dying oils by deacylating hydroxyaclated fatty acids and their esters. Swern & Jorden (J. Amer., Chem. Soc.) suggest the use of dihydroxy fatty acids and esters as synthetic waxes. Of growing interest is the development of soaps of dihydroxy fatty acids for specialised surface active uses.

Peracetic acid is produced by reacting glacial acetic acid with hydrogen peroxide in the presence of sulphuric acid (Greenspan F.B.J. Amer., Chem. Soc. 68,907 (1946). Alternatively, the peracid can be made by the interaction of acetic anhydride with hydrogen peroxide (Findley, T. W. Swern, D. S. Scanlan, J.T.R. Amer. Chem. Soc. 67,412 (1945), and Smit., Roc. Trav. Chem. 19,675-686-691 (1930)).

The Buffalo Electro-Chemical Co. Inc., U.S.A., who produce peracetic acid for the chemical industry state that epoxidation and hydroxylation reactions with this reagent and hydrogen peroxide are generally characterised by:—

High reaction efficiency (often quantitative yields)

Ease of reaction control

High reaction specificity

Ease of isolation of reaction products

Products of low residual unsaturation readily attainable

Minimum by-product formation

Use of only slightly higher than stoichiometric amounts of peracetic acid

Absence of metallic or other contamination

General solubility in the reaction medium

Applicability to aqueous and non-aqueous systems

Applicability to heterogeneous as well as homogeneous reactions

Recoverability of acetic acid for re-use.

Tinplate Exports

Shipment of tinplate to other countries is strictly controlled, stated Mr. Harold Wilson, President of the Board of Trade, in a reply to questions from Mr. G. R. Howard. No exports had been made to Japan during April to September, and it would seem unlikely that any allocation for shipment to that country would be made until supplies were adequate for canners in the U.K.

The Chemist's Bookshelf

IDENTIFICATION OF MOLECULAR SPECTRA. R. W. Pearse and A. G. Gaydon. Second Edition. 1950, London: Chapman & Hall, Ltd. Pp. xi + 276. Plates 12. 50s.

The first edition of this valuable work of reference appeared in 1941, and was designed to present the more persistent bands of molecules, arranged in order of wavelength, and in addition, a series of tables of both the absorption and emission band spectra of the molecules, listed separately.

The new edition contains data up to 1947, and in some cases up to 1949, so that the tables and other useful information about individual molecular spectra now occupy about 250 pages in the present edition as compared with about 200 pages in the first edition. The number of plates has also been increased, so that about 60 spectra are now illustrated by excellent photographs.

As in the first edition, the absorption of organic substances have not, in general, been considered for inclusion, so that apart from a few of the more obvious spectra such as those of benzene and formaldehyde, the contents are principally concerned with inorganic substances. However, the book continues to be a necessity for the spectroscopic laboratory, and the production of this edition is, as in the case of the first, a matter for congratulation to both authors and publishers. The remarkably small increase in price over ten years, which is rather less than proportional to the increase in the number of pages, is worthy of comment in these days when we regard steep increases in book prices as almost inevitable.—C.L.W.

THE EFFECTS OF ATOMIC WEAPONS. Prepared for and in co-operation with the U.S. Department of Defence and the U.S. Atomic Energy Commission. Revised September 1950.

Only a few years ago, intra-atomic structure was an esoteric interest of chemists and physicists. To-day, with its frightening consequences, it is everybody's business. That is why it is impossible to consider this grim, factual book solely from the standpoint of the scientist. The facts are soberly presented but every page cries out aloud reminding the scientist of his social responsibilities as a citizen.

Representing "the most nearly quantitative approach to atomic bomb phenomenology which can be published at this time," the text starts from a discussion of nuclear fission. With the collaboration of a wide range of researchers, the editors have then presented a word-picture, generously extended with illustrations, of an atomic explosion and its technical consequences. These include the effect of the shock wave, physical damage, thermal radiation and initial and residual nuclear radiation. From these basic data and deductions, practical civil defence themes have been developed. Radiations and their measurement are clearly explained and decontamination with detergents discussed; since radioactivity of any contaminated body will decrease, the authors point out that, in a sense, time may be regarded as a universal decontaminating agent.

The aim of this book is to promote an intelligent understanding of the effects of the enormous energy release which results from an atomic explosion. The standing of the individual authors and that of its editor, Professor Glasstone, professor of physical chemistry, are sufficient to testify to its accuracy. But the very intellectual eminence of these men has led them into difficulties in writing for the lay public. What, for instance, is the enquirer after atomic truth to make of comments such as these "For elements of low atomic weight and gamma rays of moderate energy, the photo-electric effect and pair production are negligible and then it is possible to write

$$I = I_o B(\epsilon_o, \mu_c x) e^{\mu_c x}"$$

Even for civil defence administrators, architects and engineers—who are explicitly referred to as possibly interested readers—parts of this text are going to be tough going.

Chemists in general will find this the most informative account yet of atomic explosion phenomena—incomparably fuller than our Home Office Civil Defence Manual II with which it invites comparison. But technical interest can only be a part of one's feelings in turning over these macabre pages.—I.B.

• OVERSEAS •

New Source of Saponin

A rich source of saponin, the natural soap used for making certain fire extinguisher foams, has been discovered in the heartwood of a British Guiana tree. Announcing this in their latest annual report, the Forest Products Research Board says that as much as 8 to 10 per cent of soluble material has been found in the Mora excelsa tree, of which about half is saponin.

Belgian Chemicals for Russia

Belgium is to supply chemicals valued at 50 million francs to the U.S.S.R, within the framework of the new trade agreement which is valid until 1 May, 1951. In addition, Belgium will ship 64,000 tons rolled iron and steel goods, 6000 tons copper wire, 5000 tons crude lead, 4500 tons of copper and 650 tons of tin, as well as an unspecified quantity of industrial diamonds. In return, Belgium will receive, apart from wheat and coarse grain, 20,000 tons of ferro-mangan, 25,000 tons of manganese ore, 5000 tons of asbestos, 6000 tons of phosphates, 150,000 tons of potassium salts (40 per cent), timber and newsprint.

Nickel Deposits Found in Greenland

Deposits of nickel ore have recently been found in north-west Greenland. Further investigations are required to show whether they are of economic value.

Expansion of French Metal Group

The well-know French non-ferrous metals group Societe Miniere et Metallurgique de Penarroya, Paris, is to increase its share capital from 1,613.75 to 1,800 million francs. This is the result of the decision of an extraordinary general meeting. The transaction has been authorised in order to finance, among other things, the absorption of the Soc. Miniere Metallurgique et Chimique de l'Orb, of the Soc. Française des Mines de Zinc d'Ain-Nouba.

Advanced Type of Crucible

An advanced type of crucible, suitable for fusing metals and other substances at high temperatures, is being manufactured by an Australian company at Waratah, New South Wales. The crucible eliminates annealing, has very high refractory characteristics, and has self-glazing properties which prevent oxidation. Its high thermal conductivity causes a faster melting of metals than in the usual type of crucible.

Aluminium Works May Close

Unless supplies of aluminium increase the works of Alumase, Ltd., Northamptonshire, employing 200, may have to close by March, 1951. A recent statement by the managing director indicated that the firm was now using 200 tons of aluminium a month, but there was the possibility of its supply of aluminium being restricted to about half that figure in the new year.

Nylon Plant for Denmark

Official permission for the import of the machinery required to equip a factory for the manufacture of nylon has been obtained by a Danish firm, Edwards & Rasmussen. Annual output of the proposed plant is scheduled at about 60 tons of yarn during the first few years, eventually reaching an annual output of 300 tons. This should prove sufficient to cover the requirements of the Scandinavian group of countries.

Nematocides Cure Soil Sickness

Liquid chemicals that turn into gas upon entering the soil are being used by American farmers to conquer the once mysterious "soil sickness." The underground gas attack kills millions of microscopic ellworms, called nematodes, which attack roots of plants. The chemicals, called nematocides, are derived from petroleum. They have proved remarkably effective against these pests, according to a report to the American Chemical Society by Dr. B. G. Chitwood, of the Catholic University of America.

New Coating Intermediate

A new baking-type coating intermediate that is expected to form a base for a whole new field of protective coatings has been developed in the U.S.A., by the chemical division of the General Electric Corporation. Called R-108 and said to combine outstanding chemical resistance with flexibility and heat resistance, this intermediate has been described as a new concept in coating materials. Based on selected phenol derivatives developed in the General Electric laboratories, R-108 is compatible with a variety of coating resins. Among qualities claimed for it are resistance to alkalis, acids, oxidising agents, solvents, salts and other corrosive chemicals over a wide temperature range; extreme toughness, flexibility and resistance to abrasion, and unusual stability to ageing at high temperatures.

• HOME • •

Tin Prices Record

After a setback on 7 December when tin prices were quoted on the London Metal Exchange at £1080-1090 per ton for cash (a decrease of £52 10s). the market rallied on 8 December. Prices hardened, until, on 19 December, tin reached the record figure of £1802 10s. per ton.

Railway Research Organisation

The various research divisions of the railway regions are to be combined into one department, which will operate from 1 January under the direction of Mr. T. M. Herbert, formerly research manager to the LMS Railway. Chemistry research will continue at laboratories in all the regions, but the engineering, metallurgy, protective coatings, physics and textile divisions will all be located at Derby. Operational research headquarters will be in London.

Choral Society Aids Charities

Monsanto Choral Society recently gave a performance of the "Messiah" at the George Edwards Hall, Cefn Mawr. The event was organised by the local branches of the British Legion and the R.A.F.A. on behalf of the memorial committee.

Tar Works Fire

Fire broke out at the premises of Lancashire Tar Distillers, Ltd., in Hawthorne Road, Bootle, early on the morning of 12 December. The Bootle Fire Brigade was summoned at 7 a.m. A huge smoke pall covered the district. The various tar stills and other equipment at the works are situated in the open and when the brigade arrived at the main gate of the yard they were met by a sea of blazing tar which was creeping towards them. The tyres of a motor vehicle parked in the works roadway were ignited by burning tar and destroyed. First indication of the outbreak came when an explosion occurred inside one still containing 20 tons of tar. It was later ascertained that the base of the still had collapsed and the tar pouring through the gap was ignited by the furnace. The explosion scattered blazing tar over a wide area. The firemen, using four high-powered spray jets, soon began to bring the fire under control but just as they were getting the upper hand a second explosion in the still re-ignited the tar. The second outbreak was, however, quickly extinguished.

Tar Distillation Merger

An agreement has been signed by which the Litherland tar works of Brotherton & Co., Ltd., becomes part of the co-operative scheme of Lancashire Tar Distillers, Ltd., of Manchester. The new arrangement concerns only the tar distillation business of Brotherton & Co., Ltd., based on the Litherland works and will in no way affect their chemical and dyestuffs interests. The present merger is an important step in the integration of the tar distilling interests in the area under the North West Gas Board.

Laboratory Explosion

Fire which broke out around a cylinder of hydrogen, following an explosion in a physics laboratory at Manchester University was quickly extinguished. Damage was confined to a small area.

Shale Firm's Provident Plan

A provident scheme for employees is to be introduced by Scottish Oils, Ltd., beginning 1 January, 1951. The scheme, which is non-contributory on the part of employees, will ensure that a sum equal to 10 per cent of the annual earnings of each employee will be credited to him in the form of a lump sum on retirement. The scheme is based on a scale rising from 5 per cent credit in the first year of membership by yearly increases of ½ per cent to a maximum of 10 per cent in the eleventh year of membership. Thereafter, 10 per cent will be credited as long as membership lasts. About 5000 workers are concerned in the new scheme.

KID Exemptions

The following chemicals have been exempted from Key Industry Duty for the period 18 December to 31 December, 1950: Dibutyl phthalate, diethyl phthalate, dimethy phthalate, dioctyl phthalate, 2-methylnaphthalene, 2-naphthyl benzoate, paraformaldehyde.

Non-Ferrous Metal Supplies

The view that widespread redundancy of labour and a serious decline in production in all metal industries may result from a shortage of non-ferrous metals was expressed by the British Non-Ferrous Metals Federation in a statement issued in Birmingham on 11 December. Criticising the system of bulk purchases the Federation stated that the Minister of Supply, in carrying out that policy, had not at any time called for the advice of metal consumers.

· PERSONAL ·

THE retirement of LORD McGOWAN, K.B.E., D.C.L., LL.D., from active office as chairman of the board of Imperial Chemicals Industries, Ltd., at the end of this year, was announced on 14 December.

Lord McGowan, who is retiring for reasons of health, will be succeeded by Mr. John Rogers, a deputy chairman of the company, on 1 January, 1951.

Lord McGowan

Lord McGowan has been actively associated with the company and its predecessors in title for more than 60 years. He was chairman of Nobel Industries, one of the four companies which merged to form I.C.I., Ltd., in December 1926, and was first president and deputy chairman of I.C.I. on its incorporation, succeeding Lord Melchett on the latter's death in December 1930.

Of Lord McGowan it has been written that he was "probably the highest explosive that ever emerged from Nobel's factory," and it is beyond dispute that his energy and concentration of purpose and his patriotism have played an important part in the welding of the British chemical industry into the powerful and progressive mechanism that it is today.

John Rogers

Mr. John Rogers has been actively associated with I.C.I., Ltd., and its predecessors in title since 1899. At the time of the merger in 1926 Mr. Rogers was a director of Nobel Industries, Ltd., one of the four constituent companies of I.C.I. He was elected to the board of I.C.I. at its first meeting and was appointed a deputy chairman in 1940. Mr. Rogers is a director of African Explosives and Chemical Industries and Cape Explosives Works.

Long-service awards to employees were presented by Robey & Co., Ltd., on Friday, 8 December, in the canteen of its works at Lincoln.

This was the third annual celebration of this nature. On the first occasion in 1948 the scheme only embraced employees with over 35 years' service, but last year it was extended to include all workmen with 10 years' service and over. This considerable increase in scope resulted in 320 men being qualified this year with a total of over 7000 years' service between them.

Under the revised scheme, Savings Certificates are given to each employee on reaching 10 years' service. Each subsequent year a further gift is credited and presented every fifth year. In addition, an illuminated certificate is also presented at the end of 35 years' service, and a further certificate every five years thereafter.

A message was read from the chairman and joint managing director, Mr. W. T. Bell, who was prevented from attending by indisposition.

Seven employees with over 50 years' service were formally presented to Mr. F. B. Perry, who apart from Mr. W. T. Bell, has the longest service as a director. The seven, whose record totalled 371 years, were: A. Banyard (57 years); J. Couldron and I. Priestley (each 53 years); J. Candwell, F. Lamming, F. Moses and T. Pask (each 52 years).

Fifty-year diplomas were also presented by Mr. Perry to J. Bugg, W. Heathershaw and I. Watson.

The evening ended with a concert and a vote of thanks to the directors was proposed by Mr. D. S. Maplethorpe, chairman of the Board of Co-operation. Appreciation of the artists, Mrs. Newton and the canteen staff, and the organising committee was expressed by Mr. A. Johnstone, works manager.

Principal guest at the annual dinner of the Textile Institute's Lancashire section, to be held at the Midland Hotel, Manchester, on Friday, 12 January, 1951, will be MR. BARRY T. BENSON, first secretary and commercial attaché of the U.S. Embassy. Mr. Benson is to propose the toast "The Textile Institute," to which the Institute's president, MR. G. H. SPENCER, J.P., of Nottingham, will respond.

The Stock and Chemical Markets

HOLIDAY influences have been an additional factor restricting stock market business this week. Prices were inclined to ease, although British Funds strengthened a little. Movements were generally small. Industrial shares derived some benefit from the F.B.I. statement, although further news of metal and other shortages suggests that earnings of many companies may be affected early in the new year.

It is now generally agreed that where earnings have risen and a large part placed to reserve, there can be no objection under existing conditions to shareholders having moderately higher dividends. Indeed, the Government does not ask for rigorous limitation of dividends to last year's rates, but for moderation and restraint in payments. For many years shareholders in some leading industrial companies have had unchanged payments, but there is now a fairly general movement to pay more if profits have advanced. Turner & Newall provide a recent example with a total of 20 per cent, against the 15 per cent in 1949, although 2½ per cent of the increase is a special anniversary bonus.

Chemical and kindred shares held steady with Imperial Chemical at 42s. 6d., Monsanto 50s., Fisons 25s. 3d., and Laporte Chemicals 5s. units, 9s. 10½d. W. J. Bush were 83s. Albright & Wilson held steady at 30s. 9d., following the share bonus announcement. Boake Roberts were 33s., F. W. Berk 2s. 6d. shares, 12s. 6d. and Brotherton 10s. shares kept firm at 21s. 6d. Amber Chemical 2s. shares were 2s. 6d., Bowman Chemical 4s. shares kept at 5s. 9d. and British Chemicals & Biologicals 4 per cent preference were 17s. 3d.

Despite the dividend increase, Turner & Newall eased to 86s. 6d. United Molasses were good up to 47s. 6d., on the belief that the company's dollar earnings are increasing. Lever & Unilever, at 42s., held steady, and Tube Investments were at nearly £6⅞ on the news that the £5 million of new £1 preference shares are being offered to shareholders at par.

Dunlop Rubber reacted to 54s. 9d. British Oxygen at 88s. 6d. held firm, but General Refractories, at 24s., lost their recent small improvement. United Glass Bottle (77s. 6d.) again held their price, but there were fluctuations in Triplex Glass, which are now 26s. 6d. British Glues & Chemicals 4s. units, at 22s., yield only 3½ per cent. but there are hopes that the dividend for the current year may be raised to 30 per cent. Goodlass Wall (39s. 7½d.) is another share which is the subject of higher dividend talk. It is realised, however, that 1951 is likely to be a very difficult year for industry in many respects, because apart from shortages of materials, there is the prospect of the April Budget bringing still higher taxation.

Boots Drug, at 48s. 9d., have eased a little. Sangers were 24s., Beechams deferred, 13s. 3d. and Griffiths Hughes, 21s. Borax Consolidated at 55s. 6d. were again steady. British Aluminium firmed up to 39s. 3d., on the belief that shortages of aluminium will not be as bad as was once feared. International Nickel shares were higher on balance, partly because of the increase in the price of the metal. Glaxo Laboratories at 59s. 4½d. were active again. Textiles lost ground, although Courtaulds were more active, largely because of market talk of higher dividend possibilities.

Oils failed to keep best prices, although the higher Apex and Kern River dividends helped sentiment and aroused hopes that some of the bigger oil companies may perhaps pay more in 1951.

Market Reports

MANCHESTER.—Although showing signs of seasonal quietness, the demand for heavy chemicals has been fairly brisk during the past week. Textile and other consumers have been taking steady deliveries of caustic soda and other alkalies, as well as potash, ammonia and magnesium compounds and a wide range of other chemicals. Quotations generally are strong in undertone and a further stiffening has occurred in a few directions. Supplies of most tar products are being well absorbed.

GLASGOW.—There has been considerable activity in the Scottish heavy chemicals market and an increasing demand for all types of chemicals and raw materials. Scarcity of drums has made deliveries difficult. The shortage of supplies is having an adverse effect upon the export market.

Dearer Nickel

The price of refined nickel in the U.K. was raised to £406 a ton delivered works, with appropriate increases for other countries—announced by the Mond Nickel Company on 18 December. The previous price was £386 a ton. The International Nickel Company of Canada and the International Nickel Company, Inc., of the U.S.A., also announced an immediate increase in prices of refined nickel.

Technical Publications

APPLICATION of Monel in many industrial countries for fat-splitting tanks and equipment is described in "Wiggin Nickel Alloys" (No. 328) just issued. Monel has excellent resistance to corrosion by both the hot fats and sulphuric acid in the concentrations used in the Twitchell process. The use of Inconel irons for glass gathering and blowing irons is the subject of an illustrated article, which shows that the usual oxide formed through the contact of glass and steel is avoided by this method.

* * *

ROAD Tar Binders and tarred materials are the subject of an *aide-memoire* prepared by the British Road Tar Association in booklet form to make readily accessible a summary of the relevant British Standard specifications and other publications.

* * *

DANGERS of atomic warfare and the effects of atomic weapons are summarised by Dr. Hirschfelder, professor of chemistry at the University of Wisconsin, in the November issue of the "Atomic Scientists News."

* * *

INSTRUMENTS and equipment for the colour temperature control of butt welding are described in "Elcontrol News" (November, 1950, No. 2). Also given are details of photo-electric flame failure equipment for use with oil burners and apparatus for loop tension control.

* * *

A REVISED edition of standard steel lists of AISI and SAE is being offered to the trade by Babcock & Wilcox Tube Company. The four-page technical data card covers three groups: basic open-hearth and acid-bessemer carbon steels and resulphurised carbon steels, open hearth and electric-furnace alloy steels, and stainless and heat-resisting steels, subject to standard variations for check analysis. Percentage of chemical composition limits and other elements are stated for each steel. Known as technical data card 119C, the ready-reference list is available on request.

* * *

PROCEEDINGS of the third conference on chemical works safety held at Scarborough from 29 September to 1 October have now been published in full, with illustrations, and are now available from the Association of British Chemical Manufacturers' Association (5s. post paid). The number of delegates attending exceeded the two previous years.

COLORIMETRY of a more accurate nature is the object of apparatus designed to simplify absorptiometry, details of which are set out in its latest illustrated leaflets by Hilger & Watts, Ltd. The microptic colorimeter is an advanced instrument designed on the Duboscq principle. Its most outstanding feature is the incorporation of optically read glass scales to determine directly, without the use of tables or intricate calculation, the percentage concentration of a coloured solution by comparison with a standard solution of known concentration.

To Combat Sulphur Shortage

IN VIEW of the dire world sulphur shortage, Italy, the leading European sulphur producer and exporter, is planning to take steps to increase its sulphur output. While the scarcity of sulphur has already created serious bottlenecks in the chemical and other industries of the leading industrial countries of the world, it will undoubtedly bring about an improvement of the situation of the Italian sulphur mining industry which has been in difficulties for many years past through U.S. domination of the market and its own high-cost structure.

It is interesting to note that the new capital increase of the well-known Montecatini mining and chemical group from 30 to 40 milliard lire—which has just been authorised by an extraordinary general meeting—is largely to be used for increasing the productive capacity of the group's sulphur mines, to increase output of pyrites, sulphuric acid and chemical fertilisers. Other units of this widely-ramified group which are to benefit from this capital increase are the production of nitrogen, man-made fibres, plastic materials, and solvents.

The Board reports a market increase of sales since the war in Korea and most units are utilising their capacity to the full. With a few exceptions, production index figures have increased above pre-war.

Second Packaging Course

Because of the popularity of the first educational course for junior executives held in November, the Institute of Packaging has arranged a second course to be held at Shell-Mex House, Strand, London, W.C.2, from 12-16 March, inclusive. Completed applications should be sent to the Secretary before 12 February 1951.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

C. WILES, LTD., Beverley, fertiliser manufacturers. (M., 23/12/50). Nov. 21, deb., to Martins Bank, Ltd.; general charge.

SCRIVENS, LTD., Birmingham, manufacturing chemists. (M., 23/12/50). Nov. 16, mort., to Scottish Amicable Bldg. Soc. securing £3400 and any other money, etc.; charged on 167 Castle Square, Webley Castle, Birmingham. *Nil. Mar. 14, 1949.

BRADLEY & BLISS, LTD., Reading, manufacturing chemists and druggists. (M., 23/12/50). Nov. 14, charge, to Barclays Bank, Ltd.; charged on Victoria Works, 19 Princes Street and 12a Eldon Place, Reading. *£6000. Jan. 3, 1950.

CHARLES A. MAIR, LTD., London, S.W., chemists. (M., 23/12/50). Nov. 21, £1773 deb., to Mrs. A. Mair, London; general charge.

HOWE & GUNSON, Blackpool, disinfectant manufacturers. (M., 23/12/50). Nov. 17, deb., to Barclays Bank, Ltd.; general charge. *Nil. May 20, 1950.

Satisfaction

J. J. WHARMBY & SONS, LTD., Mansfield, chemists. (M.S., 23/12/50). Satisfaction Nov. 16, of mort. reg. Aug. 18, 1949.

Company News

Albright & Wilson, Ltd.

The directors of Albright & Wilson, Ltd. announce that the issue of one ordinary stock unit of 5s. for each 5s. stock unit at present held, agreed at the extraordinary general meeting of the company held on Tuesday, 19 September, 1950, can now be effected following the approval of the High Court to the variation of the rights of the 6 per cent original preference shares. Stock certificates will be posted on 15 January, 1951, to stockholders on the register at the close of business on 29 December, 1950. The new stock will rank equally with the existing Ordinary stock for the final dividend payable in respect of the company's year ending 31 December, 1950.

Increase of Capital

The capital of CYCLO CHEMICALS, LTD., Manfield House, 376 Strand, W.C.2, has been increased from £3000 to £10,000.

New Registrations

Vermico, Ltd.

Private company. (28,038). Capital £1000. Objects: To carry on the business of exfoliating vermiculite by heat processing, and that of brokers of and dealers in hydrous silicates, etc. Subscribers: R. M. Chubb and A. Hadden, manufacturers, both of 540 Tollcross Road, Glasgow.

Henry Corbett, Ltd.

Private company. (489,425). Capital £20,000. Objects: To acquire the business of a drysalter and oil and colour merchant carried on by Henry Corbett at 60-66 Newtown Row, 7-9 Ashted Row, Brearley Street and Rower Street, all in Birmingham. Directors are: H. Corbett, E. J. Taylor, N. H. Cornwall. Reg. office: 60-66 Newtown Row, Birmingham.

Coleyshaw, Ltd.

Private company. (489,413). Private company. Capital £25,000. Manufacturers of colours, pigments, dyes, varnishes, chemicals, synthetic resins, plastics, etc. Directors: H. B. Coleyshaw, and C. M. Beavis. Reg. office: The Laurels, Joinings Bank, Langley Green, near Birmingham.

U.S. Synthetic Rubber Plans

Production of synthetic rubber at the Government-owned plant at Akron was announced by the Goodyear Tyre and Rubber Company to begin on 18 December. The factory, which has been in process of modernisation since September, is expected to have a daily output capacity of 150,000 lb.

MR. EDWARD FAIRHURST left for Australia on 15 December to become manager of the new rayon fabrics works of Bradford Dyers' Association, Ltd., at Sale, near Melbourne, Australia. Before taking up his new appointment Mr. Fairhurst was manager of the Brighouse works of Thornton, Hannam & Marshall, Ltd.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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Manufacture of esters of aromatic dicarboxylic acids.—R. Page and W. Hunter. Feb. 14 1949. 646,968.

Process of preparing polymerisation products in granular form.—Monsanto Chemical Co. Feb. 17 1948. 646,969.

High-voltage selenium rectifiers and manufacturing process.—Standard Telephones & Cables, Ltd. Feb. 20 1948. 646,852.

Process for preparing artificial oestrogenic compounds and products obtained thereby.—A. Horeau and J. Jacques. Feb. 26 1948. 646,828.

Resinous semi-conducting materials including conductive carbon.—Westinghouse Electric International Co. March 9 1948. 646,970.

Process for dyeing or printing superpolyamide fibres.—Ciba, Ltd. March 30 1948. 646,742.

Process for the production of oxygen-containing organic compounds.—N.V. De Bataafsche Petroleum Maatschappij. April 14 1948. 646,744.

Continuous precipitation of cellulose derivatives.—Hercules Powder Co. April 27 1948. 646,971.

Preparation of ephedrine and salts thereof.—Soc. Des Usines Chimiques Rhone-Poulenc. May 18 1948 646,750.

Process for preparation of heterocyclic compounds.—N.V. De Bataafsche Petroleum Maatschappij. May 19 1948. 646,829.

Method of and means for preventing and removing incrustation upon containers for liquids.—H. Loosli. May 22 1948. 646,882.

Manufacture of dyed leather.—J. R. Geigy A.G. May 28 1948. 646,753.

Apparatus for determining liquid densities.—Natal Tanning Extract Co., Ltd. June 2 1948. 646,831.

Method of and apparatus for high-speed high-pressure oxygen cutting of metals. —Linde Air Products Co. June 11 1948. 646,887.

Azo compounds containing a thiazolone cyanine dye component.—General Aniline & Film Corporation. June 14 1948. 646,888.

Process of preparing trinuclear, cyanine dyes.—General Aniline & Film Corporation. July 12 1948. 646,896.

Compositions for the protection of metals from corrosion.—N.V. De Bataafsche Petroleum Maatschappij. July 15 1948. 646,662.

Production of dimethylamine.—Robinson Bros., Ltd., and S. A. M. Thompson. July 7 1949. 646,976.

Soldering.—Mond Nickel Co., Ltd., E. C. Rhodes and D. W. Rhys. July 28 1949. 646,899.

Thiazolone cyanine dyes and the method of preparing the same.—General Aniline & Film Corporation. Aug. 6 1948. 646,900.

Treatment of cellulose esters and ethers with naphthopyridine derivatives to inhibit gas fading.—General Aniline & Film Corporation. Aug. 13 1948. 646,832.

Process for the production of 17 hydroxysteroids.—Syntex Soc. Anon. Aug. 16 1948. 646,979.

Manufacture of contrast agents comprising iodo-substituted esters. — Glaxo Laboratories, Ltd., and K. N. Speyer. June 14 1949. 646,764.

Detergent composition.—Scottish Oils, Ltd., and D. Stewart. Sept. 15 1949. 646,765.

Crystal contact devices and methods of manufacture thereof.—General Electric Co., Ltd., R. L. Breadner and R. W. Douglas. Oct. 25 1949. 646,674.

Manufacture of low pressure mercury vapour lamps comprising a vitreous envelope internally coated with a fluorescent powder. E. K. Cole, Ltd., and J. N. I. Evans. Oct. 5 1949. 646,676.

Apparatus for mixing the vapour of a volatile anaesthetic with air.—W. Edmondson and W. Jones. Oct. 27 1949. 646,680.

Textile printing process.—I.C.I., Ltd., and R. Thornton. Oct. 28 1949. 646,690.

Heat treatment of metals.—A. G. E. Robiette. Oct. 20 1949. 646,691.

Continuous manufacture of sheets of glass.—Soc. Anon. Des Manufactures Des Glaces et Produits Chemiques De St. Gobain, Chauny, & Cirey. Oct. 28 1948. 646,693.

Coloration of cellulose acetate.—T. E. Marchington & Co., Ltd., G. D. Sutton and O. Boothby. Oct. 29 1948. 646,769.

Process for the manufacture of accumulator plates sintered from metal powder. —Accumulatoren Fabriek Varta N.V. May 18 1948. 646,313.

Azo coupling components for diazotype photoprinting materials.—General Aniline & Film Corporation. May 24 1948. 646,543.

Selective hydrogenation processes.— E. I. Du Pont de Nemours & Co. June 30 1948. 646,408.

(continued on page 894

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Patent Processes

continued from page 892)

Dielectric compositions.—British Thomson-Houston Co., Ltd. Aug. 9 1948. 646,410.

Process for the manufacture of methyl and ethyl chlorides.—Dow Corning Corporation. Sept. 13 1948. 646,620.

Fluorescent luminous bodies.—Egyesult Izzolampa es Villamossagi Reszvenytarsasag. Sept 15 1948. 646,414.

Process for the manufacture of aldehydes from β-ionone-like ketones.—Roche Products, Ltd. Sept. 22 1948. 646,623.

Process for the treatment of nickel-containing ores.—International Nickel Co. of Canada, Ltd. Sept. 28 1948. 646,488.

Sintered hard metals.—Bohler & Co., A.G., Geb. Sept. 30 1948. 646,627.

Manufacture of paints and varnishes.—C.D. Patents, Ltd., M. Kaufman, and A. F. Williams. Oct. 6 1949. 646,325.

Production of organohalosilanes.—J. G. Fife. (Dow Corning Corporation). Oct. 28 1948. 646,629.

Magenta coloured phenazonium dyestuff photographic images by colour development.—General Aniline & Film Corporation. Dec. 14 1948. 646,348.

Colour developers for the production of phenazonium dyestuff photographic images.—General Aniline & Film Corporation. Dec. 14 1948. 646,490.

Graphitic alloy steels and nitrided products made therefrom.—Nitralloy Corporation. May 4 1945. 648,242.

Production of vitamin preparations.—S. E. Matthews (Severoceske Tukove Zavody, Drive Jiri Schicht, Narodni Podnik). Aug. 9 1946. 648,247.

Method for making a water solution of raw aluminates of lime and its application to the manufacture of alumina.—Soc. Des Ciments Francais. Aug. 27 1946. 648,248.

Polymers of N-disubstituted amides of the acrylic acid series.—General Aniline & Film Corporation. Oct 2 1946. 648,250.

Production of hydroxyalkylamides of acrylic acids and polymers therefrom.—General Aniline & Film Corporation. Oct. 2 1946. 648,251.

Production of hydroxyalkylamides of of poly alpha-substituted acrylamides.—General Aniline & Film Corporation. Oct. 2, 1946. 648,252.

Production of hydroxyalkylamides of the acrylic acid series.—General Aniline & Film Corporation. Oct. 2 1946. 648,253.

Alpha-substituted N-hydroxyalkylacrylamides.—General Aniline & Film Corporation. Oct. 2 1946. 648,254.

Graphitic alloy steel castings and the nitriding of such castings.—Nitralloy Corporation. Dec. 3 1946. 648,258.

Atomised copper-lead base alloys.—Federal-Mogul Corporation. March 28 1947. 648,379.

Ion generators.—Compagnie Generale de Telegraphie Sans Fil. May 30 1947. 648,261.

Method and apparatus for removing gaseous and readily vaporisable materials from liquids.—Girdler Corporation. June 3 1947. 648,310.

Oxidation of olefines.—Distillers Co., Ltd., E. P. Goodings and D. J. Hadley. June 16 1948. 648,386.

Concentration of vitamins. — M. W. Kellogg Co. July 31 1947. 648,268.

Process of producing magnesium oxide and products resulting therefrom.—Permanente Metals Corporation. Aug. 6 1947. 648,315.

Production of oriented polymers and copolymers.—Firestone Tire & Rubber Co. Aug. 7 1947. 648,392.

Process of synthesising hydrocarbons.—Standard Oil Co. Aug. 8 1947. 648,317.

Process of pouring metals and products produced thereby.—Vanadium Corporation of America. Aug. 26 1947. 648,321.

Fibrous filter media.—W. I. Taylor and J. W. Grebby. Sept. 21 1948. 648,395.

Coatings of vitreous compositions on aluminium, and aluminium alloy surfaces.—R. P. Fraser and A. L. Cianchi. Oct. 28 1948. 648,279.

Production of water-insoluble cation-active phenol formaldehyde condensation products.—American Cyanamid Co. Oct. 24 1947. 648,281.

Method of producing organo-phosphorous compounds.—California Research Corporation. Dec. 4 1947. 648,328.

Process for the production of complete fertilisers.—Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Dec. 9 1947. 648,330.

Absorption refrigerating apparatus of the inert gas type.—Electrolux, Ltd. Dec. 17 1947. 648,288.

Manufacture of dyestuff preparations.—Ciba, Ltd. Dec. 19 1947. 648,332.

Refractory siliceous material. — P. Ciferri. Dec. 30 1947. 648,335.

Methods of and apparatus for utilisation of the thermal energy released in the course of atomic decompositions. — C. Chilowsky. Dec. 31 1947. 648,293.

Process for the manufacture of aluminium by means of melt electrolysis at relatively low temperatures.—Aktieselskabet Ardal Verk. Dec. 31 1947. 648,337.

Manufacture of the dichlorohydrins of 4-vinylcyclohexene. — Imperial Chemical Industries, Ltd. Jan. 19 1948. 648,456.

Preparation of bromine - containing chlorinated aldehydes and ketones. — United States Rubber Co. Jan 30 1948. 648,463.

Exports Still Higher

According to official Swiss trade returns for November, exports of the chemical and pharmaceutical industries (in million Swiss francs) have increased further to 57.1 as compared with 52.2 in October. Since November of last year, export values have increased by about 50 per cent. Dyestuff exports have maintained their leading position with 24.2 (22.1), followed by pharmaceutical goods 20.7 (18.8). Exports of industrial chemicals too have risen from 8.1 to 9.6.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

DESIGN ENGINEERS, with B.Sc. Degree in Mechanical Engineering or equivalent, and not over 40 years of age, are required by The Bahrein Petroleum Company, Limited. Experience to have been in design of Oil Refineries, coal tar, chemical distillation or similar plants, involving electrical and steam systems, pressure vessels, fractionating columns, heat exchange and pumping equipment. Salaries according to qualifications and experience, plus kit allowance. Provident Fund. Free board and air-conditioned accommodation, medical attention. Low living costs. Two-year agreements with paid leaves and transportation. Write, giving full particulars of age, education and experience, to **Box 3785, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

OIL Refinery Contractors handling large contracts for Refinery Plant, require **CONTRACT ENGINEERS** in their London Office. Duties involve broad direction and co-ordination of all phases of the work, including planning, drafting, purchasing, progressing and erection. Desirable qualification is previous experience of Refining Industry or Heavy Engineering, including a wide knowledge of pumping, heat-exchange equipment and instrumentation, and the appointment offers excellent prospects to suitable men. Applicants should write fully, stating qualifications, age and experience, to **Foster Wheeler, Ltd., 3, Ixworth Place, London, S.W.3.**

TECHNICAL RECORDS OFFICER required by the Division of Atomic Energy (Production), to be responsible to the Technical Records Group Manager, for the operation of the technical records and statistical department of a large chemical factory at Springfields, Salwick, nr. Preston.

Candidates must have either an Honours Degree in Chemistry, Associateship of the Royal Institute of Chemistry, or equivalent qualifications. They must have an aptitude for compiling, correlating and interpreting plant operating data and, preferably have had some operational experience in a chemical factory. Salary will be assessed according to qualifications and experience within the ranges £570-£720 per annum (if over 30) and £330-£545 per annum according to age (if under 30). A Superannuation Scheme will be introduced in the near future. Applications to **Ministry of Supply, D.At.En. (P) Risley, nr. Warrington, Lancs.,** quoting Reference SC3/1. Rs.3310—20-JS-7.12 50

WORKS CHEMISTS AND TECHNICAL ASSISTANTS are required by the Division of Atomic Energy (Production) at Windscale Works, Sellafield, Cumberland, and Springfields Factory, Salwick, nr. Preston The work involves the control of novel and complex chemical processes, many of which are still under development. Candidates must have either an Honours Degree in Chemistry, Metallurgy or Chemical Engineering, Associateship of the Royal Institute of Chemistry, or the Institution of Metallurgists, Corporate Membership of the Institute of Chemical Engineers, or equivalent qualifications. Candidates need have no specialised knowledge of the chemistry of radio-active elements. Facilities exist for training in factory administration and there will be opportunities for promotion.

Salary for Works Chemists will be assessed according to age and experience, within the range £330-£720 per annum, and for Technical Assistants according to age, within the range £330-£570 per annum.

Applications to **Ministry of Supply, D.At.En. (P), Risley, nr. Warrington, Lancs.,** stating post applied for and location preferred.
RS.3305-JO-20.

SITUATIONS VACANT

PLANT DEVELOPMENT AND PROCESS ENGINEERS, qualified in Chemical Engineering or Petroleum Refining Technology, required by Bahrein Petroleum Company, Limited. Age limit, 25-40. Two-year agreement periods with passages and paid leaves. Free air-conditioned accommodation, board and medical attention, kit allowance, low living costs. Salary according to experience. Write, with full particulars of age, education, experience, to **Box 3784, c/o Charles Barker & Sons, Ltd. 31, Budge Row, London, E.C.4.**

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The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Notes and Comments

The Coming Year

THE year 1949 ended on a bright note. Recovery from the ravages of war was rapidly becoming manifest and production was expanding. A more plentiful supply of goods reflected the return to better health of many industries, including—despite some shortages—the chemical industry. Now 1950 is almost ended and the outlook is not so good. Since Korea, the effect of the international situation has been to aim a crippling blow at British economic and industrial recovery. Zinc, sulphur, copper, rubber, tin, glycerin, solvents, and many other essential raw materials threaten shortly to become, if not very scarce, then at least morbidly expensive. Expansions are being shelved, progress inhibited and the cost of living increased by new shortages being thrust upon us by distant events. It is to be hoped that 1951 will not prove as difficult as many predict it may, but there is little doubt that it will prove less easy than the year which is rapidly slipping by. THE CHEMICAL AGE, however, wishes all its friends a most happy and prosperous 1951.

Exports Records and the Future

CHEMICAL exports in November achieved a new high level of over £11 million, which should assure the easy attainment this year of the estimate of the Economic Survey. Much of this success is due to improvement of trade within the Commonwealth. Canadian and Australian shipments were nearly doubled in value compared with the same month of last year and the Indian and Pakistan markets steadily developed. A remarkable feature was the continued increase of sales to the U.S.A. with a total of £1,185,441, more than four times the 1949 figure. Some of this November achievement must, of course, be attributed to the rising costs of raw materials. How far the level of chemical exports will be able to be maintained next year is a serious problem. Shortages of raw materials are bound to have an adverse effect. The world scarcity of sulphur has, indeed, begun to be felt in many directions. One chemical firm has already reported a reduction of its main export, lactic acid, due to this shortage.

The Blow Falls

NO news (it is often said) is good news, but we disagree. Until the recent pronouncement by the U.S. Department of Commerce that 200,000 tons of crude sulphur would be exported from that country in the first quarter of 1951, there was a hope—however forlorn—that Great Britain would not be too

badly hit by any reduction in sulphur supplies. Now we know how much we are going to get—81,645 tons. True, it might have been worse. At one time, the gloomy view held sway that a 50 per cent cut was likely in 1951. At least that pessimistic prediction has not been fulfilled. But 81,645 tons represents a cut back of about 30 per cent on the quality really required. At present, over 38,000 tons is needed every month by the multifarious users in the U.K. From this it seems that Great Britain must scratch around for something like an entire month's supply of sulphur, before the end of March next year. How badly the country's economy will be affected by the shortage cannot, however, be directly assessed from these figures. Some fertilisers, which in the past have been made in this country, are now being imported. This will relieve some of the burden on the sulphuric acid industry, but there are numerous other industries to which sulphur is absolutely essential. It is to be hoped, therefore, that some efficient system of priorities will be used so as to ensure that, wherever possible, those manufacturers who literally cannot carry on without sulphur or sulphuric acid will receive sufficient for their needs.

MOBILE FACTORY ON VIEW

THE acute shortage of metal containers lends particular interest to an exhibit at the second National Packaging Exhibition to be held at Olympia, London, from 30 January to 9 February.

One firm has taken the entire ground floor of the Empire Hall for a single exhibit—probably the largest ever shown indoors in Britain. This is to be a complete mobile metal drum-making factory.

The mobile unit has been created to meet the special needs of petroleum, oil and similar large companies working in undeveloped areas of the world. Hitherto they have had to undertake the somewhat expensive process of (a) constructing a pipeline or (b) operating a fleet of tankers to bring the oil back to civilisation. If these methods were impracticable, then they had to resort to the shipping from Britain of empty drums—which meant paying heavy freight charges for what in effect was nothing more than "packaged air."

A mobile factory of this nature makes that unnecessary. It is complete in every sense of the word, with plant, and equipment for producing painted and printed drums from flat sheet, together with a mobile cinema, a canteen (able to serve 100 meals an hour), and sleeping and recreation quarters for the operatives.

A special team of British workers has been trained to man the mobile factory.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

SULPHUR CONSUMPTION RESTRICTED

Rationing to be Introduced from 8 January

THE Board of Trade has announced that because of the reduction in the export of United States sulphur to this country it will be necessary to restrict consumption. From 8 January rationing will be introduced for the distribution of sulphuric acid and crude and processed sulphur.

The manufacture of sulphuric acid from raw materials other than sulphur will not be affected, but the distribution of all acid produced "will have to be controlled in the interest of the national economy."

Two Orders have been made which prohibit from 8 January next, except under licence of the Board, the supply of sulphuric acid and the supply of crude sulphur which has been recovered by any industrial process; or of processed sulphur.

Processed sulphur is described as flowers of sulphur, roll sulphur, or sulphur which has been subjected to any one or more of the processes of grinding, precipitating, and refining. The supply of processed sulphur in quantities not exceeding 56 lb. in any one month is not affected.

The Orders, which were published on 29 December, are the Control of Sulphuric Acid Order, 1950, and the Control of Sulphur Order, 1950.

Farmers Worried

The cut in sulphur supplies and the shortage of superphosphates for British agriculture were discussed 21 December at a Press conference in London after a meeting of the council of the National Farmers' Union. Mr. H. N. Palethorpe, chairman of the commercial committee, said that although he had heard unofficially that the Government had undertaken to obtain the 300,000 tons of superphosphates required this year from the Continent he was worried about the position next year if the cut in supplies from America was to be permanent

A supplementary consignment of 100,000 tons which America had supplied this year was for all industries, and the amount being supplied to OEEC countries had been drastically cut. A little sulphur was obtainable from Italy but it was difficult to get and was expensive. Next year the European countries would need all the superphosphates they could produce for their own use.

An alternative source of sulphuric acid was pyrites, of which there was an ample supply in Spain, and if the cut in supplies from America was to be permanent some consideration must be given quickly to the establishment of plant for making sulphuric acid from pyrites in this country. If farmers were cut off from supplies of superphosphates the fertility of the soil would be seriously affected. Not only potatoes but every farm crop was dependent on some sort of phosphate fertiliser.

American Sulphur Exports

QUOTAS for the amount of sulphur which may be shipped to foreign destinations during the first quarter of 1951 have been announced by the U.S. Department of Commerce.

The over-all total for export licensing was fixed at 200,000 long tons of crude sulphur and 7500 tons of refined sulphur. Individual quotas of crude sulphur for various European countries (in long tons) include: Great Britain, 81,465; France, 20,125; Germany, 3000; Switzerland, 3000.

Britain has been importing sulphur at the rate of 360,000 tons a year for acid making, and 95,000 tons for other uses. The U.S. quota means a cut of from 25 to 33⅓ per cent on the U.K. requirements.

While this allocation was about what was expected as a result of the recent Washington discussions, it represents the barest minimum needs and considerable hardships will be involved.

Among the various applications of sulphur are vulcanising rubber, hop farming, and medical and pharmaceutical products. A large amount of sulphur and sulphuric acid is also used in the viscose rayon trade.

Australia and New Zealand at present hold large stocks and are suffering sharp cuts in their supplies. It is expected, however, that their quotas will be increased later in 1951.

Production of sulphur in America is about five million tons a year, of which 1.5 million tons has been exported.

Quicksilver Dearer

The price of quicksilver in London rose sharply on 20 December to £42 10s.-£43 per flask compared with £37-£38 previously. This reflected a rise in prices at the source, Spanish quicksilver having been increased by $15 to $115 f.o.b.

URANIUM FROM GOLD MINES

South African Supplies for Britain and U.S.A.

URANIUM from South African gold mines, which constitute one of the world's biggest known sources, is to be made available to the British and American governments. An agreement to this effect has been made between the three countries following talks held recently in Johannesburg.

This agreement, announced by the Ministry of Supply, brings to a successful end several years of intensive research and development, in which all three countries have taken part, on the problem of making recovery of uranium from South African gold ores an economic proposition. Although there is not a large percentage of uranium in this ore, so much is mined that the total amount available will be relatively large, and the operation becomes economically possible because the gold "tailings" (ore from which the gold has been extracted) are in most cases a waste product.

Four mining companies will be responsible for initial production. These are: West Rand Consolidated Mines, Ltd.; Daggafontein Mines, Ltd.; Blyvooruitzicht Gold Mining Co., Ltd.; Western Reefs Exploration and Development Co., Ltd.

Additional Plants Possible

Consideration will be given to the construction of additional uranium plants on other mines if required. Ultimately, South Africa may become one of the world's most important uranium producers.

Although uranium will be an additional product, the revenue and earnings from it will not be on such a scale as to affect materially the financial position of the companies concerned.

The Johannesburg negotiations were between representatives of the South African Atomic Energy Board, which includes leading members of the gold mining industry, and representatives of the United Kingdom and the United States. Preliminary discussions were held in the same city a year ago.

Design and construction of the necessary plant are proceeding as a matter of urgency. Owing to security considerations, information on certain parts of the programme cannot be made public.

The board of West Rand Consolidated Mines, Ltd., announces that by an arrangement with the Atomic Energy Board of South Africa it will erect a plant for the extraction of uranium from the gold residue slimes of the 40,000 tons monthly capacity of the West Reduction Plant at present under construction.

This plant will be used for the treatment of ore mined from the Bird Reef series, which ore body contains uranium in quantities considerably in excess of the contents of the other reefs in the mine.

It is estimated that the plant will be ready for operation in the latter part of 1952, and the contract with the board will be for the sale of uranium over a period of 10 years from the time the plant is in full production.

A Reasonable Profit

The price payable for the uranium will be related to the cost of production on a basis which will ensure the redemption of the capital cost of the plant, plus interest, over the 10-year period of production, and should provide a reasonable margin of profit to the company on the capital invested.

Arrangements have been made through the Atomic Energy Board whereby the company can obtain a loan of the entire capital cost of the plant, such loan being repayable during the 10-year production period. It will therefore be unnecessary to call upon shareholders to provide any of the finance required.

The agreement with the Atomic Energy Board provides that the company must pay to the State a proportion of its profits from uranium at the same rate applicable to the profits obtained from mining for gold. It is estimated that on the present basis of taxation and costs the net profit accruing to the company will be of the order of 9d. to 1s. an ordinary share per annum on the existing capital of the company.

Nickel Prices Higher

The International Nickel Company of Canada, Ltd., and its associated companies, the International Nickel Company, Inc., of the U.S.A., and The Mond Nickel Co., Ltd., in the United Kingdom, have announced that their prices for refined nickel are being increased immediately. The Mond Nickel Company is raising its price in the U.K. to £406 per ton delivered works, with appropriate increases for other countries.

WORLD PRODUCTION OF FERTILISERS

AN outline of the world position in the production and use of fertilisers, and the impressive share of the Commonwealth, both in output and trade, as well as of recent developments in individual Commonwealth countries, is given in a report recently published by the Commonwealth Economic Committee, entitled *Survey of Trade in Fertilizers.*

The survey shows that world usage of chemical fertilisers had by 1948-49 risen to record levels, and that world production was well above pre-war figures. Several Commonwealth countries had expanded their production of various types of fertilisers and others had plans in hand for a considerable increase.

Consumption Greatly Increased

There has been a very substantial rise in the use of fertilisers—by 1949, nitrogen consumption increased to 37 per cent above the pre-war figure, phosphate to 44 per cent and potash to 40 per cent. The Commonwealth consumes about 10 per cent of the world total of nitrogen, and about 20 per cent of the world total of phosphate.

Nitrogen.

In 1938-39 the world output of nitrogen was 2.5 million tons. There was a sharp decrease during the war, followed by a heavy increase, the world total reaching 3.3 million tons in 1948-49, an increase of 30 per cent over the pre-war figure.

More Than Doubled

Between 1938-39 and 1948-49, output in the Commonwealth rose two-and-a-half times, and represented 14 per cent of the world total as compared with 7 per cent before the war. While the United Kingdom was responsible for the greater part of the Commonwealth output, and Canada for most of the remainder, production in both Australia and India is increasing rapidly.

Phosphate.

Before the war, the world output of phosphate rock was estimated at 13 million tons; in 1946-47 it was 17 million tons, rising to 19 million tons by 1948-49. Although little exploitable rock is found in most Commonwealth countries, the deposits on Christmas Island, and the Pacific islands of Ocean and Nauru provided (pre-war) 10 per cent of the total, or 1.3 million tons.

World production of manufactured phosphate was estimated at 5 million tons (on the basis of phosphorus pentoxide content, *i.e.*, P_2O_5) in 1948-49, as compared with 3.5 million tons in 1938. Before the war, the Commonwealth contributed about 15 per cent of the total, and nearly 20 per cent thereafter, mainly in the form of superphosphate production in the United Kingdom, Australia and New Zealand. In terms of P_2O_5, Commonwealth output rose by about 85 per cent from 1938 to 1948-49, all countries showing substantial increases.

Potash.

Estimated production of potash for fertiliser purposes was 3.2 million tons in 1948-49 as compared with 2.7 million tons in 1938 (both figures exclude the U.S.S.R.). The Commonwealth produces only minute quantities in Australia and South Africa, but some expansion is anticipated in Australia.

Trade in Nitrogen

Nitrogen.

Total trade in nitrogen recovered fairly rapidly from war-time reductions, and in 1949 it was 25 per cent higher than in 1938.

The Commonwealth is a large net exporter of nitrogen on a considerably larger scale than before the war—shipments from the United Kingdom and Canada exceeding total imports into Commonwealth countries. Shipments from the Commonwealth in 1949 amounted to nearly 20 per cent of the world total, well over twice as much as was imported into Commonwealth countries.

ESTIMATED TRADE IN NITROGENOUS FERTILISERS
Nitrogen content (thousand tons)

	1938	1949
World total **Imports*	748	908
of which Commonwealth	53	64
World total **Exports*	753	961
of which Commonwealth	114	187

* Excludes U S S R

Phosphate.

World trade in phosphate recovered rapidly after the war, and by 1949 it was about one-third higher than before the war. In this case the Commonwealth is a net importer, taking nearly twice as much as before the war and about one-third of world exports. In 1949, the Commonwealth accounted for 36 per cent of total imports, and 16 per cent of total exports.

Potash.

The production of potash (mainly an

export of France, Germany and Spain) fell seriously during the war, but by 1948 had recovered to the pre-war level, and by 1949 had shown an advance estimated at about 30 per cent.

The Commonwealth does not export potash, but imports more than twice as much as before the war, nearly 25 per cent of the world's total in 1949.

Net Trade Position

Broadly speaking, the Commonwealth is a net exporter of nitrogen, but an importer of phosphate and potash. In 1948-49 only two Commonwealth countries, the United Kingdom and Canada, exported nitrogen in significant quantities; India was the largest importer, followed by the Colonial territories. All Commonwealth countries imported phosphate, but the very large exports of ammonium phosphate from Canada together equalled about a third of the Commonwealth's total imports. The principal importer of potash was the United Kingdom; Canada took most of the remainder; no Commonwealth countries exported potash in significant quantities.

In 1948 the total value of fertiliser imports into Commonwealth countries, other than Colonial territories, was £26.8 million, and of exports £17.9 million (after taking account of exports of phosphate rock from Nauru, Ocean and Christmas Islands to Australia and New Zealand of about £1.5 million), giving a net import balance of £8.9 million. The United Kingdom took 52 per cent of the imports, mainly in the form of potash, rock phosphate and superphosphate, India took 14 per cent, Canada 9 per cent, Australia 7 per cent, New Zealand and South Africa 6 per cent each, and Ceylon 5 per cent. Canada was the principal exporter with 50 per cent of the total, followed by the United Kingdom with 38 per cent.

Recent Developments

Canada.

The fertiliser industry is becoming increasingly important in Canada. Total consumption in terms of plant nutrients increased heavily during the war and has continued to rise. Exports and imports have increased since 1938. Fertilisers have become a moderately important item of the total value of Canadian exports; the United States is the principal customer and the principal source of the imports.

Australia.

Apart from comparatively small quantities of ammonium sulphate and slag, the output of chemical fertilisers in Australia is almost entirely of superphosphate made by treating imported rock phosphate with domestically produced sulphuric acid. Before the war Australia's phosphate rock requirements were met almost entirely from the British Phosphate Commission's workings on Ocean and Nauru Islands, and this supply, interrupted during the war, has now been resumed. Indigenous rock was mined during the period 1941-45, but the quantities were small and the quality poor. Increasing amounts of sulphate of ammonia are being produced at government synthetic ammonia plants.

The expansion of the Australian fertiliser and chemical industries, which in some branches has been very marked, is expected to continue. Domestic production of ammonium sulphate is expected soon to be sufficient for requirements, and may also serve ultimately to reduce the demand for imported sodium nitrate. Supplies of potassic fertilisers are sufficient to meet requirements. The projected expansion of phosphate rock production by the British Phosphate Commission is expected to be ample to meet increased future demand; local production of sulphuric acid is also being greatly expanded.

New Zealand Recovery

New Zealand.

Production of fertilisers in New Zealand, which is mainly in the form of the manufacture of superphosphates from imported rock phosphate, recovered by 1946 from the low levels to which it had sunk during the war and it has since continued to rise. In normal times, the rock phosphate supplies are obtained almost entirely from Ocean and Nauru Islands, and since output there has been resumed, requirements are again being met.

Important plans for developing New Zealand's hill country, announced in 1949, included the provision of special aircraft for top-dressing and the erection of new fertiliser works. The New Zealand Meat Producers' Board has expressed its willingness to lend, from accumulated stabilisation funds, a substantial part of the capital necessary for the erection of a new co-operative works.

South Africa.

Production of fertilisers in South Africa is principally in the form of superphosphate from imported rock and both indigenous and imported sulphur; some rock phosphate is mined but no potash. South Africa is primarily an importer of phosphates; exports are small—mainly of superphosphate to Southern Rhodesia—

5000 tons before the war, rising to 22,000 tons in 1948. Superphosphate production is being increased, and extensions are in hand at two plants near Durban and Capetown, which will mean a considerable increase in capacity.

India.

The principal chemical fertiliser used in India is ammonium sulphate, of which a quarter was domestically produced and three quarters imported in 1949. Average imports in the four years 1946-49 were about 75 per cent higher than before the war. The United Kingdom supplied nearly all the ammonium sulphate in 1946, but this share declined to one-third of the total by 1949. During 1949 special arrangements were made for the import of about 400,000 tons of ammonium sulphate for delivery during the two years 1949-50 to meet the requirements of the "Grow More Food" campaign. Sodium nitrate, insignificant until 1946, rose in three years to one-sixth of the total; imports of phosphates also rose.

In Production Soon

Before the war, India produced very little in the way of artificial fertilisers of any kind, but imported substantial quantities, particularly of ammonium sulphate. In 1943 the Foodgrains Policy Committee estimated that India (undivided) would require at least two million tons of artificial fertilisers a year and recommended that, as a first step, immediate action should be taken to establish production of nitrogenous fertilisers at the rate of 350,000 tons a year. Investigations were put in hand, and in 1944 a technical mission from the United Kingdom reported upon the problem. The Government of India decided to erect at Sindri in Bihar, a large plant with an ultimate capacity of 350,000 tons of sulphate of ammonia a year. Production is expected to commence early in 1951, at about 100,000 tons a year, rising to the target figure in three or four years. The Government of Mysore has contracted for the construction of a fertiliser plant at Bhadravali with an annual production of 25,000 tons of ammonium sulphate and 25,000 tons of superphosphate. Production should begin in two years.

Pakistan.

General development schemes for bringing more land under cultivation and raising production levels are under way in Pakistan. Price and lack of knowledge have in the past been the reasons for the small use of fertilisers, but several provincial Governments have started schemes for subsidising the use of ammonium sulphate and for educating farmers by demonstration and publicity. The United Kingdom is the principal supplier of ammonium sulphate. The necessary raw materials for its manufacture are available in Pakistan, however, and the Government is considering a scheme for establishment of a large plant in West Pakistan.

Ceylon.

Ceylon is not yet a producer of chemical fertilisers, but progress is being made toward the setting up of a nitrogen industry, and the manufacture of nitrogenous fertilisers.

Southern Rhodesia.

Southern Rhodesia does not produce chemical fertilisers in appreciable quantities. Two factories make fertiliser mixtures from imported raw materials, part of this production being exported to Northern Rhodesia and Nyasaland. Southern Rhodesia imports a small amount of chemical fertilisers, chiefly superphosphates from South Africa.

IN THE EDITOR'S POST

Attacking the Tower

SIR,—The leading article in your issue of the 9th instant, refers to the difficulties arising from the complex chemical names of substances now coming into prominence in various fields, to the advisability of using shorter names or symbols and the desirability of an internationally agreed list of simpler names for these materials.

My object in writing is to remind you that, as mentioned in your issue of 2 September 1950, p. 827, serious attempts are being made to meet this situation. It is to be regretted that notwithstanding several press notices, the writer of your leading article does not appear to be aware of the work now being done by the B.S.I. Committee on Nomenclature. The first list of common names for pest control chemicals will be issued shortly, careful consideration having been given to the comments received on the first draft circulated last August. The committee is actively at work on a further list.

I would emphasise that close contact is being maintained with similar official bodies in the United States and in the Commonwealth countries and it is hoped that ultimately international agreement will follow.—Yours faithfully,

H. J. JONES,

Chairman, B.S.I. Committee on Nomenclature of Pest Control Chemicals.

PROTECTIVE CLOTHING

SOME recent fatalities have drawn attention to the urgent need for providing agricultural workers with satisfactory means of protection against the highly toxic effects of many modern anti-pest chemicals.

At the request of the National Farmers' Union, James North & Sons Ltd., of Godley Mills, Hyde, Cheshire, manufacturers of North P.V.C. protective clothing and gloves, etc., recently undertook a series of severe tests in their own laboratories to ascertain the degree of protection afforded by garments of their manufacture against a number of well-known proprietary agricultural chemicals.

In carrying out these tests full strength applications of various chemicals were used throughout, and contact with sample pieces of clothing material and glove fingers (which were immersed in beakers), were made over a period of seven days and in normal temperature ranges extending from frost to 75° F.

In all cases no reaction of any kind was found with the materials tested and further examination was made, after thorough washing and decontamination, with 10 per cent washing soda solution which was subsequently applied.

The chemicals used for these tests were as follows:—Murphos Parathion 20; Phosphomort; Thiopal; Fosferno 20; H.E.T.P.; Mortopal; "Abol" DNC Winterwash.

It appears that correct application and handling of these clothing materials will completely avoid the risk of serious chemical contamination to operators.

Industrial Cleanliness

A NATIONAL "Good Housekeeping" week for British Industry, from April 2-7, 1951, is being organised by the Royal Society for the Prevention of Accidents.

The object of the week, which has been arranged in co-operation with the Festival of Britain, is twofold.

First, to enlist the support of all employers and employees in securing tidiness and cleanliness in the workshop, for experience shows that they are invaluable factors in reducing accidents. Results thus achieved also increase productivity, eliminate waste and help in salvaging scrap material.

Second, to provide an opportunity for a general spring-cleaning of British factories in readiness for the Festival.

A programme of suggested activities is being drawn up and the society is preparing special publicity material, including a booklet for distribution to factory workers.

Stearic Acid Imports

THE Ministry of Food, in agreement with the Board of Trade, announces that, during the period 1 January to 31 March, 1951, further individual import licences will be granted for limited quantities of double and triple pressed stearic acid consigned from, and originating in, any country other than:—

Albania, Argentina, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian zone), Guatamela, Haiti, Honduras, Hungary, Iran, Japan, Korea, Liberia, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Tangier, United States of America, Union of Soviet Socialist Republics, Venezuela, Jugoslavia.

Applications for import licences should be made on Board of Trade form ILD/A which may be obtained from the Import Licensing Branch of the Board of Trade, Romney House, Tufton Street, London, S.W.1., or from the usual Customs Offices. For administrative convenience, importers are asked to send completed application forms to the Board of Trade through the Ministry of Food, Oils and Fats Division, London Road, Stanmore, Middlesex, to arrive there not later than 27 December, 1950.

Sulphur Recovery and Supplies

THE amount of sulphur at present recovered from treating coal gas from coke oven and coal carbonisation plant was approximately 100,000 tons a year, stated Mr. P. Noel-Baker, Minister of Fuel and Power recently.

In that part of the coal gas derived from coke ovens and coal carbonisation plants which is at present used without purification was treated for the recovery of sulphur, it was estimated that the additional sulphur so obtained would amount to 500,000 tons a year. The cost, however, would be very high.

Existence of crude sulphur deposits in the Colonies and reports of the existence of deposits elsewhere in the Commonwealth and in foreign countries had been investigated, stated Mr. Henry Rhodes, Parliamentary Secretary to the President of the Board of Trade in a written answer.

These inquiries had not shown the existence of any workable deposits. Processes for the extraction of sulphur from sulphur-bearing materials such as pyrites and spent oxide had been investigated in detail and, although they were uneconomic at the time, were now being considered.

CHEMICAL EXPORTS EXCEED £11m.

November Values Achieve New Record

EXPORTS of chemicals, including drugs, dyes and colours in November, set up a new record with a total value of £11,077,317. This exceeded October's record by £477,323 and was £4,183,623 more than the total for November 1949.

Among the notable increases revealed by *Trade and Navigation Accounts of the United Kingdom* compared with last year were: bleaching powder £31,726 (£11,852); copper sulphate £255,724 (£97,068); lead acetate £95,672 (£34,807); magnesium compounds £52,622 (£29,797); sodium carbonate £353,942 (£134,416); and caustic soda £518,991 (£254,287).

In the non-ferrous metals group, which totalled £7,090,701 compared with £5,538,156 in the same month of last year, outstanding items were tin £715,938 (£364,606); tungsten £26,522 (£8,958) and lead £101,995 (£37,316).

	Nov., 1950	Nov., 1949
	Gal.	Gal.
Cresylic acid	466,437	310,450
	Lb.	Lb.
Salicylic acid	124,584	286,444
Value of all other sorts of acid ...	£194,112	£143,559
	Tons	Tons
Sulphate of alumina	3,150	2,063
All other aluminium compounds	409	2,340
Ammonium sulphate	12,842	18,989
Ammonium nitrate	6,243	4,839
All other sorts of ammonium compounds	2,208	1,453
	Cwt.	Cwt.
Bleaching powder	29,424	11,446
All other bleaching materials ...	14,014	10,243
Collodion cotton	3,005	1,588
	Tons	Tons
Copper sulphate	4,585	2,238
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	48,119	43,180
	Tons	Tons
Fertilisers	4,674	2,533
Value of gases (compressed, liquefied or solidified) ...	£35,755	£23,575
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	15,657	5,435
	Gal.	Gal.
Tetra-ethyl lead	88,109	101,770
	Tons	Tons
Magnesium compounds ...	1,022	639
	Cwt.	Cwt.
Nickel salts	6,667	4,801
Potassium compounds ...	8,798	6,799
	Tons	Tons
Salt	24,521	22,105
	Cwt.	Cwt.
Sodium carbonate	629,093	241,328
Caustic soda	430,839	219,589
Sodium silicate	41,155	17,790
Sodium sulphate	84,930	75,126
All other sodium compounds ...	94,084	103,611
	Gal.	Gal.
Tar, creosote, anthracene oils	4,108,071	2,596,803
	Tons	Tons
Zinc oxide	1,230	1,457
Total value of chemical manufactures (excluding drugs and dyestuffs)	£6,262,007	£3,964,734
Value of quinine and quinine salts	£28,604	£24,183
	Lb.	Lb.
Acetyl-salicylic acid	238,482	195,830
	100 International Units	100 International Units
Insulin	822,656	556,361
	Mega Units	Mega Units
Penicillin	1,407,738	591,892
Total value of drugs, medicines and preparations	£2,356,836	£1,250,237
Total value of dyes and dyestuffs	£1,097,566	£627,778
Total value of chemicals, drugs, dyes and colours	£11,077,317	£6,893,694
	Cwt.	Cwt.
Plastic materials	80,851	37,736
Value of all plastic materials ...	£1,035,614	£452,645
	Cwt.	Cwt.
Chemical glassware	1,379	1,085
Value	£53,583	£49,759
	Cwt.	Cwt.
Fans	4,020	4,572
Value	£107,913	£132,814
	Cwt.	Cwt.
Furnace plant	9,066	7,019
Value	£96,412	£75,975
	Cwt.	Cwt.
Gas and chemical machinery ...	22,996	33,966
Value	£268,065	£418,364
Value of scientific instruments (optical)	£79,356	£73,001
Value of thermometers, mercury-in-glass instruments, etc. ...	£53,358	£35,407
	Cwt.	Cwt.
Air and gas compressors and exhausters	15,370	12,597
Value	£298,721	£285,828
Non-ferrous metals—	Cwt.	Cwt.
Aluminium and aluminium alloys	121,620	109,805
Value	£1,497,619	£1,285,874
	Lb.	Lb.
Bismuth metal (not including alloys)	17,563	36,170
Value	£14,775	£18,390
	Cwt.	Cwt.
Brass and other alloys of copper, other than nickel alloys	116,920	100,814
Value	£1,442,166	£949,585
	Tons	Tons
Copper	4,794	7,528
Value	£1,213,032	£1,233,675
	Tons	Tons
Lead, unwrought sheets, etc.	619	229
Value	£101,995	£37,316
	Cwt.	Cwt.
Nickel and manufactures ...	12,318	9,232
Value	£241,894	£130,673
	Cwt.	Cwt.
Nickel alloys	3,935	3,077
Value	£65,396	£63,880
	Tons	Tons
Tin, unwrought	790	483
Value	£715,938	£364,606
	Lb.	Lb.
Tungsten	39,906	11,607
Value	£26,522	£8,958
	Tons	Tons
Zinc	661	421
Value	£140,168	£59,416
Total value of non-ferrous metals group	£7,090,701	£5,538,156

SOUTH AFRICAN NEWS

From Our Own Correspondent

MANY paint pigments, including zinc oxide, are found in South Africa and are a help to the South African paint industry, says the Bureau of Standards in a report. Its good hiding power and wetting properties also make it suitable for a wide range of paints such as oil paints, flat paints, primers, roof paints and structural steel paints. The Bureau also states that the Standards Council has now published a quality specification for zinc oxide for paints, and has published three quality specifications for raw, refined and boiled linseed oils for use in paints.

Heavy duty mills, banburys and calenders are being installed by Clemco (Pty.), Ltd., Main Road, Edenvale, Transvaal, to produce cellulose acetate moulding powder, polyvinyl chloride cable-insulating compound and various kinds of plastic sheeting. This factory is now extruding tubing and rod water hose and compressor hose in diameter from ½ in. to over 3 in. From December the monthly production of acetate and PVC is expected to be raised to about 60 tons.

An oil-bound distemper for interior decoration, and intended to replace similar imported lines, has been developed after long experimentation by South African paint manufacturers, and specialised industrial finishes, formerly imported, are now being produced by a recently established firm in Johannesburg. Where it is not possible to supply a customer with a suitable finish out of its stock lines, the firm works in collaboration with its overseas associates to make the required article locally. Red lead, dry white lead, white lead ground in oil, battery litharge, assay litharge, grey oxide and non-setting red lead are now being produced by a new firm at Jacobs, Natal. By arrangement with the parent company overseas, the South African firm has at its disposal information from modern research departments, and some of the technical staff attached to the Jacobs plant have had training in Britain.

Afrian Dextran, Ltd., has been formed with a capital of £70,000, sponsored by Syfret's Trust Co., Ltd., 24 Wale Street, Cape Town, and backed by powerful American and Swiss financial interests. The chairman is Mr. T. C. Usher, who also holds a controlling interest. The manufacture of dextran blood plasma substitute is to start in March, under licence from Dextran, Ltd., of Darlington, the English company owned by Mr. T. C. Usher. The South African Government specification is now being drawn up, based on the British Ministry of Health's specification. No plasma substitute has been found capable of meeting this rigid specification, except that made by the British company, and now to be produced in the Union. Export orders for America have been taken by the African company which will bring in 250,000 dollars a year. Additional export orders to Australia are to start when the plant is running at capacity by the middle of 1951, when it is expected that 20,000 one-pint bottles a month will be available, more than three-quarters of which will be exported. Other pharmaceutical products based on dextran now coming into pilot plant production in England will be taken on by the associated company in South Africa. The production of penicillin, streptomycin and other antibiotics will start late in 1951.

According to the latest annual report of the holding company, African and Overseas Enterprises, Ltd., the Vrany Chemical Corporation, at Saldanha Bay, has started to produce premium salts and accumulated a stockpile of magnesium hydroxides for the manufacture of non-corrosive paints.

Dry weather delayed the start of the stripping season in some Natal wattle-growing districts. In parts of Zululand growers had begun to strip their plantations during September but recent reports indicate that these operations will have to be suspended temporarily until after the rains have fallen. Production is lower this year than last.

Wool Research Council

The formation of a Wool Textile Research Council has been announced by the Wool Textile Delegation. The council will consist of 21 representatives of various wool trade employers' associations, trade union officials and professors from Leeds University and West Riding technical institutions. In addition, Dr. E. G. Carter of the International Wool Secretariat, and Mr. C. A. Spencer, of the Department of Scientific and Industrial Research, are to act as observers.

The objects of the new council are to encourage research on materials, methods and processes in the industry, including the study of designs, and to co-ordinate research activities.

WORK OF THE GOVERNMENT CHEMIST

First Post-War Survey of Varied Duties

THE increasing scope and varied character of the numerous duties of the Department of the Government Chemist are summarised in the report for the year ending 31 March 1950, now published (HMSO, 1s.).

Owing to war-time restrictions and post-war economies this is the first report to be issued since 1939, and many important changes have occurred. Sir John Fox, who was appointed Government Chemist in 1936, died in 1944 and was succeeded the following year by Dr. G. M. Bennett, then professor of chemistry at King's College, London. The Deputy Government Chemist, Dr. A. G. Francis, retired in 1946 and was succeeded by Dr. J. R. Nicholls.

War, naturally greatly affected the nature and extent of the department's work, and many special investigations of considerable importance were undertaken, although not detailed in the report for lack of space.

The Department of the Government Chemist was formally constituted on 1 April 1911, but had originated in a laboratory instituted by the Board of Excise in 1842. The function of the newly constituted department was to carry out certain duties as a chemical referee laid upon the Government Chemist by Act of Parliament and to provide advisory and analytical services to all Government Departments requiring them. These services have developed widely in scope and now vary greatly in character according to the function of the department to which they are rendered.

Members of the staff serve on many committees and other bodies concerned with methods of examination and standards of quality.

Many Aspects Considered

Such advice has to be given not only with scientific knowledge but with appreciation of the legal, industrial and administrative considerations involved.

Revenue duties give rise to important services of wide scope and great variety. Part of the work is forensic and officers of the department have frequently to appear in court as expert witnesses. An extensive and well-equipped modern analytical service is maintained and *ad hoc* investigations are carried out as required.

In addition to work for other Government Departments continuous work is necessary to maintain the scientific efficiency of the Government Chemist's Department itself. Analytical methods are kept under constant review and work on new methods is always in progress.

Headquarters of the department are in the building in Clement's Inn Passage, built under the supervision of Sir T. E. Thorpe and occupied in October 1897. There are overflow laboratories at Endell Street and Clement's Inn. The laboratories at Custom House and Foster Lane, and the chemical stations at Liverpool, Glasgow and Bristol deal with Customs and Excise matters. The chemical stations at London Dock, Southampton and Hull were closed during the war and have not been re-opened.

More Space Needed

A laboratory is maintained at the Geological Survey and Museum, South Kensington, and the laboratories of the Ministry of Works Stores at Barry Road, Stonebridge, N.W.10, and at Droylsden, near Manchester, are run by the department. A senior officer of the department is located at the War Office as an adviser to the War Department and controls laboratories in London, Barry Docks, Taunton, Glasgow, and the Middle and Far East, for the inspection of food and supplies for the army.

Work of the department is hampered by restricted space and geographical scattering. Some relief will be obtained by the provision of additional space next year, but for the efficient carrying out of its functions a large new building is badly needed.

The department is organised in 24 divisions grouped in five branches. The branches deal with Revenue matters (two branches); Industrial and Mineral questions; and Food, Drugs, Agriculture and Water. The fifth branch is ancillary to the other four and provides administrative and technical services and makes special provision for physical methods and pure research.

Separation of the work of divisions is partly in accordance with departments worked for and partly follows chemical lines. The divisions, however, are not water-tight, and work may be passed from one division to another in accordance with the equipment and experience available.

During the year under review the department examined 414,172 samples. This represents an increase of 14 per cent

over the previous year. Much of the year's work, however, was not related to samples and many files and papers were submitted for elucidation of scientific and technical matters.

The Government Chemist's Department is an essential link in the fiscal system of the United Kingdom. Without the scientific services supplied by the department, it would be difficult to assess some of the duties levied by Parliament.

Tariff Nomenclature

During the past year protracted technical discussions have been in progress in connection with the proposed adoption by Western Union countries of a common tariff nomenclature, and collaborative work with the Customs and Excise Department has been carried out to ascertain how the United Kingdom Tariff system would fit in with such a nomenclature.

By the nature and scope of their primary function the Revenue branches have to deal with an enormous volume of routine samples. Many special methods of testing have been evolved which enable the examination of large numbers to be conducted swiftly and accurately.

This Safeguarding of Industries Act imposed a Customs Duty on a variety of goods with a view to the safeguarding of certain special industries, Empire goods being exempted. The Board of Trade was empowered to issue lists defining the articles covered by any of the general descriptions set out in the Schedule to the Act, and the list of chemicals first issued enumerated some 5600 synthetic organic chemicals and fine chemicals liable to the duty.

The Act has been amended and continued by various Finance Acts, and the number of chemicals liable to this duty has been increased by additional lists which include a number of general headings relating to groups of dutiable compounds.

Provision has also been made for drawback of duty on re-exported goods and for the temporary exemption from duty of listed chemicals. Liability to the duty arises not only on the listed chemicals imported as individual substances, but also in respect of the listed chemicals contained in imported composite goods.

Technical advice on a very wide range of chemicals is given; the departments also advises on the definitions of chemicals for temporary exemption from duty; and assists in the compilation of new lists. In addition samples of imported goods are submitted for chemical examination.

During the year under review a committee under the chairmanship of the Government Chemist has revised and consolidated the existing lists, and a new comprehensive list of all chemicals liable to Key Industry duty has been issued. In this revision the descriptions of a number of chemicals have been changed and they are now listed under their modern names, while a number of obsolete names have been removed and new items added.

In recent years there has been a great increase in the synthetic and commercial manufacture of new organic compounds such as synthetic vitamins, drugs, antiseptics, detergents, wetting agents and plastics.

Developments in catalytic processes in the petroleum industry have resulted in the isolation of large numbers of hydrocarbons and other products not hitherto available on a manufacturing scale. It not infrequently happens that such chemicals are imported before they are adequately described in the chemical literature. This progress has naturally been reflected in the work of the department, and in many cases an extensive search of the literature and chemical investigation is required to identify the chemicals and to determine their liability to duty.

The Water Division provides a comprehensive chemical and bacteriological analytical service. Suitability of water for drinking purposes is assessed and the germicidal value of disinfectants determined. Sewage effluents were examined and three chemical surveys of the river Humber were carried out.

Chemical Packaging

In the Industrial and Mineral branch advisory services are rendered to the Ministry of Transport on the carriage by sea of dangerous goods, including chemicals, with particular reference to suitable methods of packing and stowage to ensure safety of the ship and the crew. In view of the major developments in industrial chemicals in recent years, the present regulations which date from 1933 are being revised by a committee on which this department is represented. It is hoped that its recommendations may form the basis of an International Code.

Pyridine recovery provided an interesting example of investigatory work. The possible use of saturator liquor and crude ammoniacal liquor from ammonia recovery plants as a source of pyridine made necessary the examination of a series of samples.

The Physical Methods Division is divided into five sections: spectrochemical analysis; X-ray diffraction; infra-red spectrophotometry; polarography; and photographic work.

TRADE SECRETS

Despite the ever increasing exchange of technical information characteristic of the considerable good will which exists between industries, there still remains much which can rightly be held to be "top secret" from an employer's point of view. What can an employer reasonably expect in the way of discretion from his workers? The accompanying article provides some answers to this and other pertinent questions on "trade secrets."

THE return to normal competitive conditions makes it more than ever necessary that individual processes and methods of work should not be passed on to rival organisations. Responsible employees are naturally in a position to prejudice a business by giving its secrets to rivals and it is helpful for employers to know the way in which the law safeguards their position.

The law appreciates that mutual confidence between employer and employee is essential and a term is therefore implied in all contracts of service, whether written or oral, that the employee will act with good faith. This duty arises independently of any express terms in the contract of service, but express terms may of course, widen the duty, and their effect will therefore require subsequent examination.

The implied term forbids breaches of faith by the employee both during a particular employment and after it has ended. The master has several available remedies against an employee who breaks faith. Dismissal without notice may be given and the employer can obtain an injuction against the employee and any collaborator, restraining them from profiting by the employee's breach of duty. The employer may also be entitled to damages.

As well as preventing the passing on of confidential matters, the implied duty obliges employees to report the misconduct of fellow-employees, regardless of the offender's status. By virtue of their position, executive and over-seeing staff have to report all acts of misconduct, the duty varying with the nature of their employment and their duties. The average employee, however, need usually only report acts which are criminal, fraudulent, or clearly wrong.

Difficult to Define

The implied term also forbids the communication of "confidential information." This is rather difficult to define with precision. One concern may consider its costing system highly confidential, while another would attach little importance to the system, but much to the way in which a particular costing has been built up. The application of the term largely depends on the facts of each case, and decisions of the Courts provide a useful guide.

In one case, an employer was granted an injunction restraining his former employee from using a copy of his order book for the purpose of soliciting orders for a rival firm and was also awarded damages. Again, where the employee of a firm of engine manufacturers secretly made notes of the engine dimensions, the employers were granted an injunction restraining him from communicating this information to other persons.

Right to Good Faith

When the implied duty is being considered in relation to border-line cases, where it is not clear whether confidential information is involved, the general policy of the law that employees should be free to acquire as much skill and knowledge as possible in their trade or calling, must be kept in mind. However, the law recognises that employers have a right to good faith from their employees, and in three cases, information, no matter of what type, is always confidential.

First of these is when it is an express term of the contract that it should be so. Secondly, where the nature of the employment is such that a particular matter would obviously be defined as confidential. Thirdly, where information is surreptitiously acquired by the employee. Outside these three cases, it seems that the employee may make use of such information as he might reasonably be expected to remember. Thus an employee may canvass his former employer's customers so long as he does not make use of information acquired other than by the habit of dealing with those customers. In other words, that he does not use lists compiled during his employment.

This implied duty to keep good faith is generally an adequate safeguard to the employer, but definite terms may be necessary in the case of technical experts and managerial grades. A formal contract of service with such employees is advisable and a term putting a restraint on

their future activities when their employment ends, can be included. For such restrictions to be legally enforceable however, the employer must be able to show that they do no more than is necessary to give reasonable protection to his proprietary interests and are not against the public interest. He must show that the area or space restriction and the period for which it is to last, are reasonable.

Under this rule, a covenant by the manager of a concern using a secret process to manufacture glass bottles, that he would not serve a competing concern for five years, was upheld as being reasonable. On the other hand, a covenant by a canvasser in Islington, prohibiting him from entering similar employment within 25 miles of London, was held to be unreasonable and invalid.

Restrictive covenants give employers an added measure of protection, but the law concerning them is complex. Therefore, unless it is merely intended to prohibit an employee from entering the service of named competitors, it is advisable to obtain professional advice in drafting the covenant.

SULPHUR PROBLEMS IN U.S.

Shortages and Expected Restrictions

CRITICAL shortage of sulphur is expected to lead in the U.S.A. to formal action soon being taken to impose restrictions not only on its export but also on its domestic consumption.

Present supplies of sulphur are estimated to be approximately sufficient for five months, and the National Production Authority has already informed the industry that it may be necessary to divert some to the stock reserves. It is pointed out that prior to America's entry into the war in 1939 the nation had a 27-month supply on hand compared with the present meagre stocks.

Meanwhile, with the demand for sulphur outstripping available supplies by a good margin, NPA controls over sulphur are expected to include:—

(1) An order limiting consumption by all sulphur users to about 85 per cent of the quantity consumed in a specified base period, probably the year ended 30 June 1950, and

(2) An order reducing exports by about 25 per cent.

Interested Government agencies are reported to be considering how much sulphur must be exported in 1951 to avoid undue hardships to friendly nations.

Reserves of naturally-occurring sulphur in the U.S.A. are believed to total about 2.8 million tons. About 75 per cent of the sulphur produced is turned into sulphuric acid, which is essential for the defence programme and touches on most phases of civilian production.

The principal reason for current shortages is the fact that sulphur consumption has so far outpaced production—even record production. Although the four main U.S. producers of sulphur—Texas Gulf Sulphur Company, Freeport Sulphur Company, Du Val Sulphur & Potash Company, and Jefferson Lake Sulphur Company—may turn out some five million tons of sulphur in 1950, this will be substantially below domestic consumption and exports.

Domestic consumption is expected to total 4.5 million tons while exporters will take an additional 1.2 million tons for the year, all of which will materially reduce available stocks and inventories. To offset any drastic reductions in supplies, however, the four companies, either voluntarily or at the instigation of the government, will probably effect reductions in shipments to customers.

Meanwhile, as a result of the steady expansion of pyrites mining in Japan, production of sulphuric acid has increased sharply, according to reports of the U.S. Office of International Trade. Output in August this year was 275,600 metric tons compared with 210,720 tons in the same period of 1949. Monthly production in future is expected to fluctuate with demand, rather than, as previously, with the availability of pyrites.

European Production

In Spain the first pyrites furnace at the plant of Sociedad Espanola de Fabricaciones Nitrogenadas (Sefanitro), near Bilbao, began operations in September, marking an important step in the factory's production of sulphuric acid. The plant is believed at present to be producing some 200 metric tons daily and with the installation of additional equipment this is expected to be increased to 400 tons.

Production of sulphur ore in Italy in the first half of this year achieved a post-war record with a total of 820.560 metric tons. Italy is reported to have placed the following quantities of sulphur (in thousands of tons) at the disposal of the OEEC countries: 1951-52, 200; 1952-53, 250; 1953-54, 350; and 1954-55, 450.

Most of the industry is centred in Sicily, but it is hampered by old equipment and uneconomic methods of operation, and Marshall Aid has been requested to modernise and develop it.

THE CHEMIST HELPS TO BUILD

"BUILDING Research in 1949" is the subject of a report just published by the Department of Scientific and Industrial Research (H.M.S.O., 3s.). In it, some interesting facts are given about the way in which the work of the chemist is used to investigate the properties of building materials.

For example, investigations on the corrosion of aluminium and its alloys by building materials are continuing. During two years outdoor storage specimens embedded in rich Portland cement-sand mortar have shown slight but progressive corrosion and cracking of the mortar in varying degrees. In indoor wet storage, cracking previously observed at one year for one alloy only, has developed further. With cement-lime-sand mortar, after two years outdoors, effects are much less marked than with cement-sand mortar, while indoors no cracking has occurred.

Similar tests, indoors, in a moist atmosphere, with high calcium lime and magnesian lime mortars and with retarded hemi-hydrate gypsum plaster-sand mixes, show only slight reaction up to one year. A Keene's plaster used neat, however, caused rather more corrosion with some alloys. The observed effects are not all equally severe, but they demonstrate the desirability of using a protective treatment, such as a bituminous paint, where aluminium or a susceptible alloy is to be placed in contact with mortar or plaster in circumstances where the conditions are liable to be damp.

Weathering Tests on Aluminium

Observations are being made of the weathering behaviour of samples of cast extruded aluminium rain water goods made to British Standard 1430 and exposed at the station in a rural atmosphere. Unpainted cast goods in certain alloys have been heavily corroded after eight months' use. Others painted when in a new condition with proprietary undercoat and finishing paints have been satisfactory up to 18 months. Similar painting of corroded surfaces after wire-brushing gives an inferior finish and the life of the paint may be adversely affected. The painting procedure should normally follow that recommended in the appropriate code of practice.

A "National Building Studies" report is being prepared dealing with corrosion of steelwork in steel-clad and steel-framed houses built in 1920-1927. This survey was undertaken in collaboration with the Ministry of Works (Chief Scientific Adviser's Division) the Chemical Research Laboratory, and the Paint Research Station, to determine the extent of corrosion in cavity walls with the protective coatings then given, and to estimate the standard of protection required in future construction. A limited examination was also made of steelwork other than that in cavities, both indoors and outdoors.

Two Coats Sufficient

Simple two-coat paint protection was found to be adequate except where faulty design had permitted rain to penetrate into the cavity. Where rain-penetration can occur even the best type of protection that is economically practicable would be ineffective over the long period for which a house is normally designed. This emphasises the importance of good design as an essential safeguard.

There were few indications of excessive condensation in those wall cavities examined which had steel sheet on both sides. Where external steel sheets are used with permeable insulating materials for the inner leaf, there will be a greater risk of condensation and corrosion in the cavity unless a vapour barrier is incorporated.

A case of corrosion of a copper roof covering to a dormer window has been examined in which the metal, which had been in place for about 40 years, had become perforated with holes an inch wide where it received the drips from a tiled roof. The holes were spaced at about six inch centres, mainly in places corresponding with the position of the joints in the first course of tiles. The roof faced north-west and was more or less covered with vegetation. Attention has been drawn from time to time to similar channelling and perforation of lead exposed to the run-off from roofs. These roofs have usually been in rural districts where there has been vegetation on the slates or tiles. It seems possible that the corrosion effects are accentuated by vegetation which may be presumed to increase the acidity of the rain water draining from the roof.

During the past few years the flow of requests for tests on flooring materials has reflected the continued search by manufacturers for suitable materials to cover concrete floors.

Tests have been carried out on jointless, sheet and tiled materials and it is interesting to note that sheet materials form by far the smallest number. Even these are

not new types but modifications of rubber sheet and it seems that a new substitute for linoleum has not yet appeared in commercial amounts. The jointless materials tested have been mostly variations of pre-war types such as magnesite and cement-rubber latex. The only novel material in this group used polyvinyl acetate emulsion as the binder. New materials are most common among the tiled coverings. None of the tiles tested was in use before the war and all but one of them incorporated synthetic resin as the base. Those using thermoplastic resins have generally proved to be more successful and less restricted in use than those using thermosetting resins.

Experiments Continued

Apart from performance tests on new flooring materials submitted by manufacturers, experimental work has continued to be directed to studies aiming at providing data on which accelerated laboratory tests for wear, slipperiness, etc., can eventually be based.

Mention was made in the report for 1948 of the pilot flue which had been constructed of heat-resisting glass to study flue conditions. During the year it has been used to study condensates. The results obtained so far suggest that the chemical attack on chimneys used for domestic boilers, etc., cannot be accounted for by the formation of sulphuric acid as has previously been assumed.

A more probable mechanism is the production of a series of compounds of ammonia, sulphur dioxide and oxygen. Conditions of use will determine the relative proportions of the compounds produced which differ considerably as regards the vapour pressure of water over their solutions; at least two are so hygroscopic that they will liquefy in air of the range of humidity likely to occur in the flue. Some of them have been shown experimentally to cause relatively rapid breakdown of ordinary cements and mortars.

Interesting Conclusion

An interesting conclusion is that damage may be most rapid when a flue which has been lined with cement or cement-lime mortar is out of use; liquefaction has been observed a few hours after the fire has been allowed to go out.

The wetting of brickwork and staining of plaster, which often occurs, appears to be a separate phenomenon, though often overlapping with the formation of aggressive ammonium compounds. A major factor in this case appears to be the use of wet fuel which can introduce more water than the wet rubbish to which the trouble has often been attributed. Wet fuel may arise through insufficient covered storage accommodation, but it may arise through the fuel being delivered wet. In the course of the work a number of samples of coke were found to have a water content averaging about 23 per cent.

Non-Traditional Type Trials

Full-scale trials on non-traditional types of flue materials have now begun. Asbestos cement, cast iron, wrought iron and three varieties of enamel on steel, are being used, all attached to boilers of similar design. One of the enamels is also being tried with two other boilers, one giving hotter, and the other cooler, flue gases. They are at present being run under conditions corresponding with a convective heater system, but provision is made whereby the air-warming jacket can be used to give " air-pocket " insulation.

In all cases, any condensate forming in the upper part of the flue can be collected for examination. The period of running is not yet long enough for destructive effects to be noticed, but the data already obtained as to the temperatures prevailing in practice are likely to be useful, as little information has been published.

PLASMA FROM SEAWEED

THE only known sample in the world of a new chemical derived from seaweed, Laminarin, a possible substitute for blood plasma was shown to the Secretary of State for Scotland, Mr. Hector McNeil, when he opened a new laboratory at the Seaweed Research Institute at Inveresk, near Edinburgh, on 22 December. This use of the new chemical, which is a type of seaweed starch, is now being investigated by scientists in London.

It has been pointed out that if the new chemical can be used for blood plasma, it will considerably reduce demand for blood donors. The potential harvest of dried seaweed from the Scottish coasts next year, it was stated, was about 200.000 tons, capable of producing about 40,000 tons of the new chemical.

The new laboratory is named after the late Professor J. Masson Gulland, a native of Edinburgh and a pioneer in seaweed investigation who until his death in 1947 was professor of chemistry at Nottingham.

SIMPLE VOLUME DILATOMETER

THE simple, inexpensive volume dilatometer has been found by scientists at the U.S. National Bureau of Standards to be a valuable research tool, not only for obtaining data on volume coefficients of thermal expansion, but also for studying phase changes in solids and liquids. The continued use of volume dilatometry at the Bureau over the past 15 years has resulted in improvements in technique and in simplification of the apparatus to such an extent that accurate dilatometers can now be made and used in almost any small laboratory.

Linear dilatometers of various types have frequently been used to advantage in determining the expansivity of metals and other solid materials. They cannot, however, give correct results for liquids or other fluid materials. In these cases the volume dilatometer can be used successfully; it has been shown to have a precision of about 1 per cent.

Change of Volume

Primarily, the volume dilatometer measures the change of volume of a sample as it undergoes a change in temperature. Its secondary importance lies in the discovery of phase-changes and other transitions. Thus, if the density or volume of a substance is plotted as a function of the temperature, there will be anomalies in the otherwise smooth curve wherever there is a change of phase or other transition. These anomalies represent points at which a charge occurs in the structure of the sample or in the types of motion by which it can absorb energy. They may or may not be accompanied by the release or absorption of heat.

Materials for the construction of the instrument consist of glass tubing of any convenient size and a calibrated glass capillary. The confining liquid may be mercury or any other substance which has a known expansivity and which will not react with the sample. Uniform heating is provided by means of a bath containing alcohol, water, or a high-boiling oil, depending on the range of temperature to be studied.

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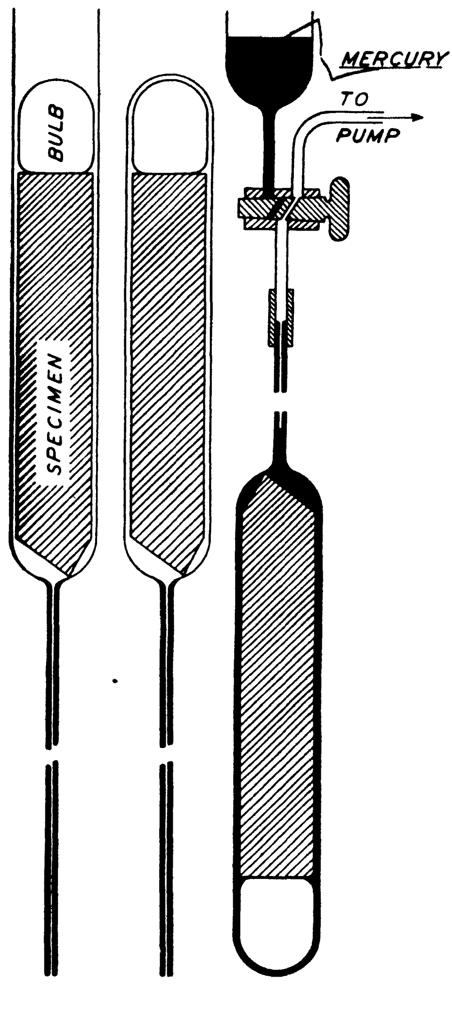


Materials for constructing the dilatometer include a glass capillary of uniform bore, 2 mm in inside diameter, and a glass tube of 20 mm. in diameter. After the capillary hds been calibrated, it is sealed to the 20 mm. tube. The sample is introduced into the tube, and a glass bulb (A) is added. This bulb is used to prevent overheating of the sample when the tube is sealed off (B). The completed dilatometer is then inverted and connected to a mercury reservoir and a vacuum pump (C), is exhausted, and filled with mercury to a convenient level in the capillary.

COBALT NAPHTHENATE

By A CONTRIBUTOR

THE use of cobalt naphthenate for initiating and accelerating gelation of polyester resins in styrene monomer is a new development of considerable practical interest. About 0.10 per cent cobalt metal concentration is claimed to give good results with 1-2 per cent catalyst, usually of the hydroperoxide type. The procedure adopted with polyester resins is to add the correct proportion of naphthenate to the liquid resin, to mix well so as to effect complete solution and then to add the necessary quantity of catalyst directly before use. Although resins containing the gelation agent can be kept for several months without showing any marked changes in viscosity, the bench life of a resin to which catalyst has been added is very short and may, in fact, only be about 30 minutes.

Effect on Resins

Cobalt naphthenate is a hard light violet coloured material containing about 12 per cent in the solid state, 8 per cent as concentrate and 6 per cent as solution. When added to polyester resins it colours the resin a purple red shade and cannot, therefore, be used where light, clear coloured fabricated forms are required.

The main advantages of employing this metallic naphthenate to initiate gelation and propagate cure of polyester resins can be summarised as follows:—

1. Cobalt naphthenate can be readily incorporated in the resin and also in most resin diluents, such as styrene; moreover, the life of the modified resin extends to several months provided no catalyst is present.
2. When used with a suitable catalyst the naphthenate enables cures to be effected at room temperatures.
3. The cobalt naphthenate has no deleterious effect (except colour) on the physical properties of the polyester resin, *i.e.*, it does not encourage crazing and will not destroy inhibitors present in resin stock.
4. There are no hazards involved in handling or using the naphthenate provided it is never mixed with the catalyst.

Storage Problems

In works practice it is of great importance that the resin should be stored at 75° F. (max.) and never kept in stock more than a few months. Standardisation of production depends upon maintaining a uniform bench life and this can only be ensured by using fresh resin of good quality, that is free from likely contaminating agents, such as metallic impurities which are known to interfere with curing. Temperature is of very great significance and an increase of 10° F. will in some cases halve the curing time. Metal content, *i.e.*, cobalt, and the percentage of catalyst employed also have a pronounced effect on the length of time it takes to polymerise or harden the resin. It is known, of course, that exposure to ultra violet light accelerates polymerisation.

The use of cobalt naphthenate as an accelerator is particularly valuable where very large shapes, such as aircraft parts and industrial mouldings, are being produced, and where it is known that the use of extraneous heat would be too difficult to apply or liable to encourage the development of internal stresses.

It is interesting to note that Rohm and Haas Company, U.S.A., now advocate the use of cobalt naphthenate as an accelerator for their "Paraplex" "P" series of unsaturated polyester resins in monomeric styrene.

SIMPLE VOLUME DILATOMETER

continued from page 913)

The preparation and operation of the volume dilatometer are as follows: A glass capillary is carefully calibrated and sealed to one end of a larger glass tube. The weighed sample is introduced into the tube, a glass bulb is added, and the tube is sealed. The bulb is used to prevent overheating of the sample during the sealing operation. The dilatometer is then weighed, evacuated, filled with mercury, reweighed, and then placed in a bath. As the bath is heated, the sample expands, forcing mercury up into the capillary where readings may be made. From the known weights and densities of the sample and the confining liquid and from the known expansivity of the confining liquid, the expansivity of the sample can be calculated. Corrections must be applied for entrapped air bubbles, nonuniformity of the capillary, and the thermal expansion of glass.

NON-FERROUS METAL PRICES

INCREASED premiums for imported electrolytic copper were announced by the Ministry of Supply last week to become effective on 1 January.

Selling prices for special shapes and special specifications will be subject to additions per ton to the basis price of copper as follows:—

CANADIAN

Vertically Cast Cakes of:—	*Present Addition*	*Addition Chargeable from 1 January 1951*
Not more than 800 lb. weight or less than 3 in. thick	£2 10s. 0d.	£4 2s. 6d.
Over 800 lb. up to 1000 lb.	£2 17s. 6d.	£4 10s. 0d.
Deoxidised 1000 lb.	£8 2s. 6d.	£11 12s. 6d.
Silver Bearing 1000 lb.	£6 17s. 6d.	£10 12s. 6d.
	Plus silver content	Plus silver content
Silver Bearing 300 lb.	£6 10s. 0d.	£9 12s. 6d.
	Plus silver content	Plus silver content
Vertically Cast Wirebars		
All sizes from 155 lb. to 545 lb.	£2 10s. 0d.	£3 2s. 6d.
750/800 lb.	£3 5s. 0d.	£3 17s. 6d.
Silver Bearing 275 lb. and 545 lb.	£6 10s. 0d.	£8 12s. 6d.
	Plus silver content	Plus silver content
Billets—Tough Pitch		
3 in. or more, but less than 4 in. dia. ...	£9 15s. 0d.	£12 2s. 6d.
4 in. or more, but less than 8 in. dia. ...	£8 10s. 0d.	£10 17s. 6d.
Phosphorised 3 in. dia.	£10 10s. 0d.	£12 17s. 6d.
Phosphorised 4 in. dia./upwards	£9 7s. 6d.	£11 12s. 6d.

AMERICAN

V.C. Cakes	*Present Addition*	*Addition Chargeable from 1 January 1951*
Silver Bearing 300 lb.	£6 10s. 0d.	£9 12s. 6d.
	Plus silver content	Plus silver content
OFHC 300 lb.	£10 12s. 6d.	£13 2s. 6d.
Billets		
Plain Phosphorised or OFHC Phos., or plain OFHC		
3 in. diameter	£10 10s. 0d.	£12 17s. 6d.
4 in. diameter and over	£9 7s. 6d.	£11 12s. 6d.
V.C. Wirebars OFHC		
255 lb. Regular or Phosphorised	£9 7s. 6d.	£11 12s. 6d.
Scalped Horizontal Wirebars	£1 10s. 0d.	£1 17s. 6d.

Pipes and Tubes for Pressure Vessels

FOLLOWING the publication of B.S.1500, Fusion welded pressure vessels, the British Standards Institution has just published in one document two Standards B.S.1507 and B.S.1508, "Ferrous pipes and tubes for pressure vessels for use in the chemical and allied industries."

This document contains a comprehensive range of specifications for pipes and tubes manufactured from 12 types of steel covering mild steel, alloy steel and austenitic steel. Full details are given of chemical compositions, mechanical properties, methods of test and tolerances in finished pipes and tubes.

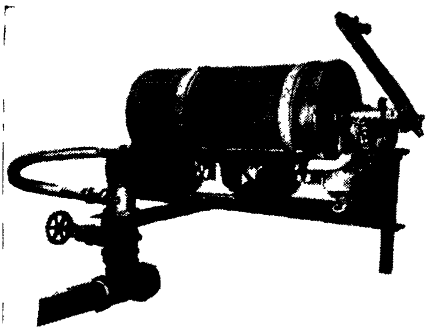
Copies are obtainable from the British Standards Institution (10s. 6d. post paid).

NEW TANK-EMPTYING DEVICE

A NEW device for the emptying of trucks or tank lorries has recently been constructed by the *Manufacture Française de Vide Tounes Automatiques*. Because it appears to offer considerable advantages over existing arrangements for the emptying of vehicles designed to carry chemicals, the new device should prove of interest to many chemical manufacturers. Chemicals normally difficult to handle, such as nitric acid, oleum and trichlorethylene are dealt with more easily by the use of the new equipment.

Essentially, the new device consists of a syphon which is primed by displacing a piston by means of a rack and pinion worked by hand. This enables any amount of gearing down, and large syphons can therefore be constructed, if required. The apparatus can be permanently fixed to a tank lorry or truck and has piping of inner diameter 3 5/32 in., allowing a flow of 5500 gallons an hour. The end of the neck has a standard union joint.

The plunger tube, which is placed inside the tank, draws the liquid from the bottom of a pan. This is fitted with a rose made

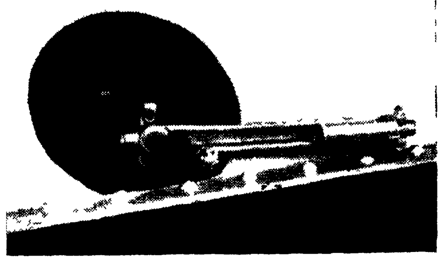


The tank-emptying device ready for operation, showing the valve-joint on the left

at the bottom of the tank. The tube passes through the wall of the dome; thus there is no inconvenience when re-filling or when the tank has to be entered for inspection or cleaning. The cylinder, containing the piston which constitutes the priming device, is placed under the side sill.

Among the advantages claimed for the new device are the elimination of the centre safety valve and the two customary drain cocks or gate valves. There is no danger of leakage from the drain-pipe, nor is there need for frequent renewal of joints and valves. Maintenance costs are low. There is little likelihood of any liquid losses due to fracture of the drain-pipe. Safety measures are provided to prevent withdrawals during transit.

The new tank emptier can be fitted to a fixed point on various existing types of tank lorries and, with a detachable pipe, can be mounted on wheels where it is required to empty trucks or tank lorries which have not been fitted beforehand.



Close-up of the device fitted to a truck, with the handle folded flat against the side sill

Crystal Process in Oil Separation

A NEW process, developed by the Texaco Development Corporation, which promises to produce fat components in practically pure form, will find its first commercial application in a new chemical plant costing several million dollars now being completed near Chicago, Illinois, by Armour and Company. The new process, fatty oil fractional crystallisation, will be used to separate various components of vegetable, marine, and animal oils by a special technique of chilling the materials in solvent to crystallise out the required component in solid form. The high purity fractions separated are the commercially important saturated and unsaturated fatty acids such as stearic, oleic, linoleic, etc., as well as the glycerides.

Japanese Scientist to Stay in U.S.A.

Dr. Hideki Yuakawa, the Japanese atomic scientist, who won the Nobel Prize for Physics in 1949, has accepted the permanent post of Professor of Physics at Columbia University. He has been visiting professor at the university since 1949.

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New Edition of Benzole Specifications

The third edition of "Standard Specifications for Benzole and Allied Products" will be available very shortly. A committee fully representative of the whole industry is responsible for the book and the view of users of the products are given every consideration. Priced at 15s. 9d., post free, it will be obtainable on a prepaid order from the National Benzole Association, Wellington House, Buckingham Gate, London, S.W.1.

Director's Will

John Maclean Henry, of Midgham, Thatcham, Berkshire, late joint managing director of Colthrop Board and Paper Mills Ltd., Thatcham, left £157,779.

Copper Supplies Restricted

Imported virgin copper supplies are to be restricted from 1 January, 1951 until further notice, it was announced by the Ministry of Supply last week. Supplies to consumers will be restricted to a total each month equal to their average monthly consumption in the first half of 1950.

Individual quotas will be notified to consumers by the Directorate of Non-Ferrous Metals, Rugby. The quota for each consumer will be based on the returns of consumption of imported virgin copper made to the Bureau of Non-Ferrous Metal Statistics.

Consumers of imported electrolytic copper in special shapes and to special specification, for instance vertically cast wire bars or 1,000 lb. vertically cast cakes, will be restricted to a monthly quota of two-thirds of their average monthly consumption of these shapes in the first half of 1950. The short delivery of one-third of special shapes may be made up, if the consumer so desires, by deliveries of standard shapes subject to the overall limitation on supplies.

No further delivery contracts will be made until the quotas have been notified.

OVERSEAS

West German Paint Output

Output of the West German paint industry this year is expected to amount to approximately 190,000 tons, valued at roughly 500 million German marks. This represents an increase of 30 per cent over the 1949 figure. The industry, however, at present contributes only 1.5 per cent to total exports. The Association of West German Paint Manufacturers (which embraces also units in Western Berlin) comprises some 500 works.

Japanese Asbestos Output Higher

Japan produced 6013 short tons of asbestos in 1949, compared with 5300 short tons in 1948.

Milan to Como Pipeline

The Societa Nazionale Metanodotti is about to complete a methane gas pipe-line from Milan to Como whence it is to be extended to Switzerland. According to a Swiss Press report, agreements have already been concluded envisaging the supply of 1 million cubic metres of methane gas per day to the Canton Ticino.

To Buy Insecticides

The Egyptian cotton industry has been allocated the sum of £500,000 for the purchase of insecticides to be expended during the new cotton season.

French Guiana Bauxite

Active prospecting work is reported to be in progress in French Guiana (Cayenne) where important bauxite deposits have been found some time ago.

Polish Potassium Discovery

The Geological Research Institute of Warsaw is reported to have recently discovered a new and important deposit of potassium salts in the Kujavian region of Poland.

Bauxite in French West Africa

Relatively important occurrences of silicate-bauxite have been found in the Niandan-Banie region of French West Africa, between Niger and Tinkisso, to the north of Kouroussa. The deposits are said to be very similar to those on the Gold Coast. Surface tests had a contents of 52.3 to 71.8 per cent Al_2O_3, 0.4 to 22.3 per cent Fe_2O_3 and 0.3 to 0.9 per cent SiO_2.

Turkish Chrome for Germany

Western Germany has recently placed an order for 1000 tons of second-grade Turkish chrome ore. Germany was in former years the leading buyer of Turkish chrome-ore, but purchases have been insignificant since 1945.

German Water Purifier

A new product, "Decarbolith" developed by the Schwarzheide works in the East German Republic from dolomite occurring in the Gera region, is reported to be a new and effective means of purifying drinking water and water for industrial purposes.

Employees Present Shield

To honour the 250th anniversary of the founding of the firm, the employees of Boileau and Boyd, Ltd., manufacturing chemists and druggists, of Dublin, have presented to the directors an inscribed shield bearing silver insignia of pharmacy and medicine.

Britain's Oil Consumption

Great Britain is now consuming oil products at the rate of about 18 million tons a year, but very little crude oils is produced here and less than one-third of our annual consumption is refined in the country. Practically all the oil, crude and refined, is being imported from the Caribbean area and from the Middle East. The British oil industry, however, is now in the midst of the most important period of development and expansion in its history; for out of the old industry, which before the war was mainly engaged in marketing products, a new one is emerging that will be capable of refining imported crude oil on a scale large enough to satisfy almost entirely the total home demand.

It is expected that by the end of 1953, when the present refinery building programme—representing the investment of about £125 million—is due to be completed, the country's total petroleum production will be in the region of 20 million tons a year, compared with the figure of 3,500,000 tons in 1948. Thus we are in sight of being completely independent of foreign refineries for the oil products upon which our industrial civilisation depends in peace and war.

By far the largest single project in this refinery development programme is the Anglo-American Oil Company's new plant. It will cost about £37,500,000, and when the refinery is completed—it is due to start up on 1 January, 1952—the annual output of petroleum products is expected to be 5,500,000 tons, including a daily production of one million gallons of high grade motor spirit. The development is due entirely to private enterprise, the total cost being met by the company without recourse to E.C.A. dollars.

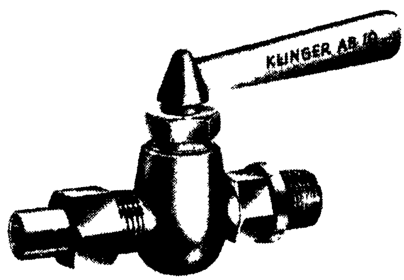
Technical Publications

CHROMATOGRAPHY—its recent developments, use in inorganic analyses, and medical applications—are dealt with in three papers to be found in the December issue of "The Advancement of Science" (VII,27) published by the British Association. Other reports of special interest to the chemist, concern the chemistry of muscular contraction, low temperature phenomena and higher technological education, while for all scientists, the lecture by Sir Lawrence Bragg "Science and the Adventure of Living," given at the Royal Institution on 25 October, should prove interesting reading.

BIOSYNTHESIS of Vitamin C during germination is the subject of an article by A. Sreenivasan and S. D. Wandrekar, which appears in the October issue of the *Proceedings of the Indian Academy of Sciences* (XXXII, 4, Section B). In section A of the same journal, a number of papers on chemical research are given, including "Studies in Oxycellulose, parts 3 and 4"; "Anthraquinone and Anthrone Series, parts 5 and 6"; "Thermal Expansion of Crystals"; "Nuclear Oxidation in Flavones and Related Compounds, part 31" and "Synthetic Experiments in the Benzopyrone Series, part 13."

THE TEXTILE Institute and the Society of Dyers & Colourists have jointly published Volume I of "Review of Textile Progress," relating particularly to progress made in 1949.

Edited by W. J. Hall, A.R.C.S., B.Sc., and C. J. W. Hooper, Ph.D., D.I.C., A.R.C.S., (of the Institute and the Society respectively), the review—running to 342 pages—is the work of 24 authors, all experts in the sections for which they are responsible. The publication costs £1 and is available from the Textile Institute, 16 St. Mary's Parsonage, Manchester, 3. Subjects and contributors are: Introduction, G. S. J. White, B.A., F.T.I.; Physics and Chemistry of Fibrous Materials, R. Meredith, M.Sc.; Cotton and Cellulose Chemistry, S. M. Neale, D.Sc.; Physics of Wool and Silk, G. King, M.Sc.; Wool and Silk Chemistry, J. B. Speakman, D.Sc., F.R.I.C., F.T.I.; Physics and Chemistry of Rayon, D. Entwistle, B.Sc., A.R.I.C.; Physics and Chemistry of Bast Fibres, H. J. Callow, B.Sc., Ph.D., A.R.I.C.; Silk Production, F. O. Howitt, M.Sc., Ph.D., F.R.I.C., F.T.I.; Wool Production, A. B. Wildman, B.Sc., Ph.D.; Fibre Production-Cotton (including Kapok), E. Lord, B.Sc.; Long Vegetable Fibres, A. J. Turner, C.B.E., M.A., D.Sc., F.T.I.; Rayon, H. J. Hegan, B.Sc., F.R.I.C.; Conversion of Fibres into Finished Yarns, J. G. Martindale, B.Sc., Ph.D., A.Inst.P., F.T.I.; Knitting, J. Chamberlain, F.T.I.; Fabrics, J. Pollitt, B.Sc.; Colouring Matters, J. Baddiley; Dyeing, H. A. Turner, M.Sc., F.R.I.C., F.T.I.; Textile Printing, R. J. Hannay, B.Sc., F.R.I.C.; Finishing Wool Fabrics, C. Whewell, B.Sc., Ph.D., F.R.I.C., F.T.I.; Finishing, R. A. McFarlane; Analysis, Testing, Grading and Defects, S. L. Anderson, B.Sc., A.Inst.P.; Textile Microscopy, A. B. Wildman, B.Sc., Ph.D., and H. M. Appleyard, A.T.I.; Laundering and Dry Cleaning, F. Courtney Harwood, B.Sc., F.R.I.C., M.I.Chem.E., F.T.I.; Mill Engineering, N. H. Chamberlan, B.Sc., Ph.D.



A new simplified "sleeve-packed" cock, to replace taper plug cocks for pressure gauges, instrument connections, etc. Tested hydraulically to 1000 p.s.i., the valve is said to give reliable service and easy maintenance under exacting conditions. It is available in six different patterns. Fuller details of patterns and sizes are to be found in an explanatory leaflet obtainable from the manufacturers, Richard Klinger, Ltd., Klingerit Works, Sidcup, Kent.

Fifty Years' Service

Mr. C. A. Wylie has just celebrated 50 years' service with the Liver Grease, Oil and Chemical Company, of Liverpool. Aged 72, he is the company's chairman, and to mark the occasion, he entertained the staff. He is a member of the council of the British Association of Chemists, and three years ago was awarded the Hinchley Medal for outstanding services to chemistry.

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Mr. J. G. Lewis and Mr. F. E. Vernalls have been appointed as directors to the Board of G. E. Simm (Machinery), Ltd., to take effect from 1 January 1951.

New Edition of Benzole Specifications

The third edition of "Standard Specifications for Benzole and Allied Products" will be available very shortly. A committee fully representative of the whole industry is responsible for the book and the view of users of the products are given every consideration. Priced at 15s. 9d., post free, it will be obtainable on a prepaid order from the National Benzole Association, Wellington House, Buckingham Gate, London, S.W.1.

Director's Will

John Maclean Henry, of Midgham, Thatcham, Berkshire, late joint managing director of Colthrop Board and Paper Mills Ltd., Thatcham, left £157,779.

Copper Supplies Restricted

Imported virgin copper supplies are to be restricted from 1 January, 1951 until further notice, it was announced by the Ministry of Supply last week. Supplies to consumers will be restricted to a total each month equal to their average monthly consumption in the first half of 1950.

Individual quotas will be notified to consumers by the Directorate of Non-Ferrous Metals, Rugby. The quota for each consumer will be based on the returns of consumption of imported virgin copper made to the Bureau of Non-Ferrous Metal Statistics.

Consumers of imported electrolytic copper in special shapes and to special specification, for instance vertically cast wire bars or 1,000 lb. vertically cast cakes, will be restricted to a monthly quota of two-thirds of their average monthly consumption of these shapes in the first half of 1950. The short delivery of one-third of special shapes may be made up, if the consumer so desires, by deliveries of standard shapes subject to the overall limitation on supplies.

No further delivery contracts will be made until the quotas have been notified.

OVERSEAS

West German Paint Output

Output of the West German paint industry this year is expected to amount to approximately 190,000 tons, valued at roughly 500 million German marks. This represents an increase of 30 per cent over the 1949 figure. The industry, however, at present contributes only 1.5 per cent to total exports. The Association of West German Paint Manufacturers (which embraces also units in Western Berlin) comprises some 500 works.

Japanese Asbestos Output Higher

Japan produced 6013 short tons of asbestos in 1949, compared with 5300 short tons in 1948.

Milan to Como Pipeline

The Societa Nazionale Metanodotti is about to complete a methane gas pipe-line from Milan to Como whence it is to be extended to Switzerland. According to a Swiss Press report, agreements have already been concluded envisaging the supply of 1 million cubic metres of methane gas per day to the Canton Ticino.

To Buy Insecticides

The Egyptian cotton industry has been allocated the sum of £500,000 for the purchase of insecticides to be expended during the new cotton season.

French Guiana Bauxite

Active prospecting work is reported to be in progress in French Guiana (Cayenne) where important bauxite deposits have been found some time ago.

Polish Potassium Discovery

The Geological Research Institute of Warsaw is reported to have recently discovered a new and important deposit of potassium salts in the Kujavian region of Poland.

Bauxite in French West Africa

Relatively important occurrences of silicate-bauxite have been found in the Niandan-Banie region of French West Africa, between Niger and Tinkisso, to the north of Kouroussa. The deposits are said to be very similar to those on the Gold Coast. Surface tests had a contents of 52.3 to 71.8 per cent Al_2O_3, 0.4 to 22.3 per cent Fe_2O_3 and 0.3 to 0.9 per cent SiO_2.

Turkish Chrome for Germany

Western Germany has recently placed an order for 1000 tons of second-grade Turkish chrome ore. Germany was in former years the leading buyer of Turkish chrome-ore, but purchases have been insignificant since 1945.

German Water Purifier

A new product, "Decarbolith" developed by the Schwarzheide works in the East German Republic from dolomite occurring in the Gera region, is reported to be a new and effective means of purifying drinking water and water for industrial purposes.

Employees Present Shield

To honour the 250th anniversary of the founding of the firm, the employees of Boileau and Boyd, Ltd., manufacturing chemists and druggists, of Dublin, have presented to the directors an inscribed shield bearing silver insignia of pharmacy and medicine.

Britain's Oil Consumption

Great Britain is now consuming oil products at the rate of about 18 million tons a year, but very little crude oils is produced here and less than one-third of our annual consumption is refined in the country. Practically all the oil, crude and refined, is being imported from the Caribbean area and from the Middle East. The British oil industry, however, is now in the midst of the most important period of development and expansion in its history; for out of the old industry, which before the war was mainly engaged in marketing products, a new one is emerging that will be capable of refining imported crude oil on a scale large enough to satisfy almost entirely the total home demand.

It is expected that by the end of 1953, when the present refinery building programme—representing the investment of about £125 million—is due to be completed, the country's total petroleum production will be in the region of 20 million tons a year, compared with the figure of 3,500,000 tons in 1948. Thus we are in sight of being completely independent of foreign refineries for the oil products upon which our industrial civilisation depends in peace and war.

By far the largest single project in this refinery development programme is the Anglo-American Oil Company's new plant. It will cost about £37,500,000, and when the refinery is completed—it is due to start up on 1 January, 1952—the annual output of petroleum products is expected to be 5,500,000 tons, including a daily production of one million gallons of high grade motor spirit. The development is due entirely to private enterprise, the total cost being met by the company without recourse to E.C.A. dollars.

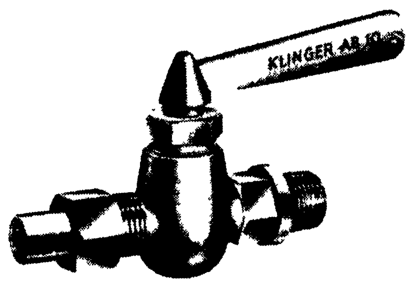
Technical Publications

CHROMATOGRAPHY—its recent developments, use in inorganic analyses, and medical applications—are dealt with in three papers to be found in the December issue of "The Advancement of Science" (VII,27) published by the British Association. Other reports of special interest to the chemist, concern the chemistry of muscular contraction, low temperature phenomena and higher technological education, while for all scientists, the lecture by Sir Lawrence Bragg "Science and the Adventure of Living," given at the Royal Institution on 25 October, should prove interesting reading.

BIOSYNTHESIS of Vitamin C during germination is the subject of an article by A. Sreenivasan and S. D. Wandrekar, which appears in the October issue of the *Proceedings of the Indian Academy of Sciences* (XXXII, 4, Section B). In section A of the same journal, a number of papers on chemical research are given, including "Studies in Oxycellulose, parts 3 and 4"; "Anthraquinone and Anthrone Series, parts 5 and 6"; "Thermal Expansion of Crystals"; "Nuclear Oxidation in Flavones and Related Compounds, part 31" and "Synthetic Experiments in the Benzopyrone Series, part 13."

THE TEXTILE Institute and the Society of Dyers & Colourists have jointly published Volume I of "Review of Textile Progress," relating particularly to progress made in 1949.

Edited by W. J. Hall, A.R.C.S., B.Sc., and C. J. W. Hooper, Ph.D., D.I.C., A.R.C.S., (of the Institute and the Society respectively), the review—running to 342 pages—is the work of 24 authors, all experts in the sections for which they are responsible. The publication costs £1 and is available from the Textile Institute, 16 St. Mary's Parsonage, Manchester, 3. Subjects and contributors are: Introduction, G. S. J. White, B.A., F.T.I.; Physics and Chemistry of Fibrous Materials, R. Meredith, M.Sc.; Cotton and Cellulose Chemistry, S. M. Neale, D.Sc.; Physics of Wool and Silk, G. King, M.Sc.; Wool and Silk Chemistry, J. B. Speakman, D.Sc., F.R.I.C., F.T.I.; Physics and Chemistry of Rayon, D. Entwistle, B.Sc., A.R.I.C.; Physics and Chemistry of Bast Fibres, H. J. Callow, B.Sc., Ph.D., A.R.I.C.; Silk Production, F. O. Howitt, M.Sc., Ph.D., F.R.I.C., F.T.I.; Wool Production, A. B. Wildman, B.Sc., Ph.D.; Fibre Production-Cotton (including Kapok), E. Lord, B.Sc.; Long Vegetable Fibres, A. J. Turner, C.B.E., M.A., D.Sc., F.T.I.; Rayon, H. J. Hegan, B.Sc., F.R.I.C.; Conversion of Fibres into Finished Yarns, J. G. Martindale, B.Sc., Ph.D., A.Inst.P., F.T.I.; Knitting, J. Chamberlain, F.T.I.; Fabrics, J. Pollitt, B.Sc.; Colouring Matters, J. Baddiley; Dyeing, H. A. Turner, M.Sc., F.R.I.C., F.T.I.; Textile Printing, R. J. Hannay, B.Sc., F.R.I.C.; Finishing Wool Fabrics, C. Whewell, B.Sc., Ph.D., F.R.I.C., F.T.I.; Finishing, R. A. McFarlane; Analysis, Testing, Grading and Defects, S. L. Anderson, B.Sc., A.Inst.P.; Textile Microscopy, A. B. Wildman, B.Sc., Ph.D., and H. M. Appleyard, A.T.I.; Laundering and Dry Cleaning, F. Courtney Harwood, B.Sc., F.R.I.C., M.I.Chem.E., F.T.I.; Mill Engineering, N. H. Chamberlan, B.Sc., Ph.D.



A new simplified "sleeve-packed" cock, to replace taper plug cocks for pressure gauges, instrument connections, etc. Tested hydraulically to 1000 p.s.i., the valve is said to give reliable service and easy maintenance under exacting conditions. It is available in six different patterns. Fuller details of patterns and sizes are to be found in an explanatory leaflet obtainable from the manufacturers, Richard Klinger, Ltd., Klingerit Works, Sidcup, Kent.

Fifty Years' Service

Mr. C. A. Wylie has just celebrated 50 years' service with the Liver Grease, Oil and Chemical Company, of Liverpool. Aged 72, he is the company's chairman, and to mark the occasion, he entertained the staff. He is a member of the council of the British Association of Chemists, and three years ago was awarded the Hinchley Medal for outstanding services to chemistry.

The Chemist's Bookshelf

FORENSIC SCIENCE AND LABORATORY TECNICS. Ralph F. Turner. 1949, Springfield, Illinois: Charles C. Thomas. Oxford: Blackwell Scientific Publications, Ltd. Pp. xxv + 240. Figs. 82. $6.50.

In this country, while courses in forensic medicine and medical jurisprudence are a part of the training for certain professional qualifications, and are hence included in the curricula of universities, courses in other branches of forensic science, as such, are not generally recognised. The forensic medicine course must, of necessity, touch on certain aspects of other branches of science, and in particular of chemistry. At various centres *ad hoc* courses for the training of police officers are given. But otherwise, those wishing to become proficient in any of the branches of forensic science must rely largely on a limited number of standard works and on self-training.

Matters are apparently quite different in the United States, since it is claimed that the present book is intended " as a teaching laboratory manual for colleges, universities or police departments training students for forensic science."

The field covered is very wide. As a consequence, in each section, to quote from the chapter on Documents, " if a student desires to specialise to such an extent that he can become proficient in this branch of scientific investigation, he must be willing to devote himself to an extensive study of the literature; to a period of training under a qualified examiner; and to a complete study of all phases (of the subject) and numerous other related questions. The following programme does not begin to scratch the surface of such a course of study, but is designed only to give the student some insight into typical . . . problems and the mode of attack necessary for correct solution."

Such a statement is in itself a salutary reminder that in this, as in any other *general elementary* course, there can be no expectation that there will emerge at the end a finished high-grade scientist, ready to tackle with fictional ease any or all of the problems of scientific detection that may be put into his hands. Nevertheless, any student of science or any scientist who conscientiously follows the well-chosen series of laboratory exercises given in this book (preferably, as the author envisages, under the direction of a qualified instructor) will benefit enormously thereby. He will almost certainly have been impressed with the necessity, if he is to become first class, of ultimate specialisation. And he will have the broad background without which specialisation would not be justified.

The general reader will find this well laid out and excellently illustrated book an interesting scientific, as opposed to a popular, approach to the subject. Most of it is simple enough to be comprehended by a reader with an average school science background.

The claim of the book, however, to act as a practical text and reference for investigators in the field is hardly justified, except in so far as any scientist will benefit, from time to time, by browsing through an elementary laboratory manual dealing with his speciality.

The section of the book devoted to chemistry is almost entirely concerned with toxicology. Elsewhere in the book a few other chemical procedures are included in appropriate places.—C.L.W.

Alkyl Chlorides in U.K.

THE FIRST commercial production in the U.K. of the higher alkyl chlorides is claimed by Leda Chemicals, Ltd., of Wharf Road, Ponders End, Middlesex. This is the first time that these products have been produced commercially outside the U.S.A.

Lauryl, cetyl and stearyl chlorides are among the Leda products. These are valuable intermediates in the manufacture of quaternary ammonium compounds and other cationic surface active agents, and also the higher alkyl mercaptans, amines and nitriles.

An interesting development is the new production of specialised quaternary ammonium and pyridinium compounds made to specification for pharmaceutical houses, who have for long been looking for a U.K. source of these materials.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may

(Note.—The Companies Consolidation Act of provides that every Mortgage or Charge, as herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DARGUE INDUSTRIALS, LTD. (formerly DARGUE ACETYLENE GAS CO., LTD.), Newcastle-on-Tyne. (M., 30/12/50). 20 November, mortgage to Portland Building Society, securing £2800 and further advances; charged on 70, 72, 74 and 76 City Road, Newcastle-on-Tyne. *£1990. 17 December, 1949.

TRAGASOL PRODUCTS, LTD., Hooton, gum manufacturers. (M., 30/12/50). 28 November, deb. to Martins Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£9000. 3 January, 1950.

EXPANDED ALUMINIUM PRODUCTS (READING), LTD., London, E.C. (M., 30/12/50). 22 November, £800 debs., part of a series already reg.

Increases of Capital

The following increases of capital have been announced: SHAKE SALT AND CHEMICAL CO., LTD., from £8000 to £125,218; W. J. BUSH AND CO., LTD., from £750,000 to £800,000; SPENCER (BANBURY), LTD., from £250,000; TODDINGTON ESTATES, LTD., from £150 to £50,000.

New Registrations

Procter, Johnson & Co., Ltd.

Private company. (489,482). Reg. 15 December. Capital £20,000. Manufacturers of colours and chemicals. Directors: J. Procter, J. C. Procter and G. Procter. Reg. office: Excelsior Works, Bank Street, Clayton, Manchester.

Thomas Reid (Chemists), Ltd.

Private company. (489,452). Capital £5000. Retail and wholesale chemists and druggists, etc. Directors: T. Reid, W. M. Reid and W. A. Reid. Reg. office: 28 Station Road, Harpenden, Herts.

Private company. (489,486). Capital £1000. Analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: E. E. Russell and M. V. Russell. Reg. office: The West Wynd, Letchworth, Herts.

J. E. R. Simons, Ltd.

Private company. (489,548). Capital £100. Manufacturers of and dealers in insecticides, fungicides, fertilisers, etc. Directors: J. E. R. Simons and Roy E. Simons. Reg. office: Natts Farm, Potter Street, nr. Harlow, Essex.

Leverhulme Memorial Lecture

THE BASIC principles underlying discovery, are the objective outlook engendered by the discipline of research, accuracy of experimentation and clear thinking in other words, scientific integrity. This was the substance of the third Leverhulme Memorial Lecture given by Professor T. P. Hilditch at Liverpool University.

Citing as an example the work of two University bio-chemists, Professor Hilditch spoke of the close relationship between academic and technical development. At the beginning of the century there had been a striking contrast between the highly-developed state of the soap industry, and the lack of basic knowledge about the constitution of fats.

Two of the four main soap factories at Port Sunlight, for instance, must have been in production before the chemical constitution of oleic acid, the most important soap-making material, had been finally settled. This leeway had been amply made up in the last 50 years, in which more fundamental knowledge about fats had been gained than in the whole of the preceding century. The advances made between 1900 and 1950 fell a little short of even that high standard of achievement which Lord Leverhulme demanded from himself, and looked for in his fellow-workers.

Unsettled Tin Prices

Following the record prices quoted on the London Metal Exchange on 19 December there was a reaction on 20 December when spot metal was quoted at £1260-£1270, a reduction of £37 10s. On 21 December there was a recovery, though the final quotations were still down on balance, cash being £1250 and three months £1112 10s.

Prices of British Chemical Products

Acetone and Copper Sulphate Dearer

London. — Owing to the Christmas holiday, business on the chemicals market has been very restricted and chief interest has centered on contract replacements. The overall movement prior to the holiday was fairly substantial with consumers' delivery specifications covering the full extent of their contracts and the demand in almost all sections remains strong. So far as prices are concerned the year is finishing on a very firm note and supply difficulties which are already apparent are almost certain to bring about price increases. In the coal tar products market the year has closed on a brisk trade with most products displaying a firm undertone.

Manchester.—Since the tail end of last week, business for heavy chemical products, in regard both to contract deliveries and to fresh bookings, has been virtually at a standstill. Only a moderate weight of new orders has been reported since the re-opening of the market. Deliveries of alkalis and other leading products have been resumed on a fair scale and should be back to normal in the early days of next week. Active conditions in most sections of the market are also anticipated for the tar products.

Glasgow.—Business is mainly concerned with putting forward contracts for next year, although in many instances chemicals are in such short supply, largely owing to the sulphur and sulphuric acid position, that advance orders are not a possibility. Export business remains dull also owing to shortage of supplies.

Price Changes

Rises: Acetone, copper sulphate, lactic acid, mercuric chloride, tartaric acid, ammonium sulphate, compound fertilisers, cresylic acid.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 1 ton, £69 ; 80% pure, 1 ton, £74 ; commercial glacial 1 ton, £82 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £118 per ton.

Acetone.—Small lots : 5 gal. drums, £105 per ton ; 10 gal. drums, £100 per ton. In 40/50 gal. drums less than 1 ton, £85 per ton ; 1 to 9 tons, £84 per ton ; 10 to 50 tons, £83 per ton ; 50 tons and over, £82 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 5d. per proof gallon ; 5000 gal. lots, d/d, 2s. 6½d. per proof gal.

Alcohol, Diacetone.—Small lots : 5 gal. drums, £133 per ton ; 10 gal. drums, £128 per ton. In 40/45 gal. drums : less than 1 ton, £113 per ton ; 1 to 9 tons, £112 per ton ; 10 to 50 tons, £111 per ton ; 50 to 100 tons, £110 per ton ; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER : Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER : £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £47 per ton.

Ammonium Carbonate.—1 ton lots ; MANCHESTER : Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. MANCHESTER : £5 2s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £179 10s. per ton.

Antimony Oxide.—£220 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots as to grade, etc., 1s. 9¼d. to 2s. 4¾d. per lb. Crimson, 2s. 6½d., to 3s. 3½d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d ; 2-ton lots, £27 5s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d ; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£156 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£143 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4-ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Per lb., d/d buyers' premises, for 5 cwt. or over, anhydrous, 1s. 7d. plus 10%, other, 1s. 7d.; 1 to 5 cwt., anhydrous 1s. 7½d. plus 10%, other 1s. 7½d. Higher prices for smaller quantities. All subject to a trade discount of 5%.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 2s. per lb.

Copper Chloride.—(63%), d/d, 2s. 2d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63%), d/d, 2s. 1d. per lb.

Copper Sulphate.—£64 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £8 17s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £114 per ton.

Formaldehyde.—31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1,260 s.g. 227s. 6d.—230s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—21s. per lb.

Iron Sulphate.—F.O.R. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £105 per ton; dark tech., £95 per ton ex works; barrels returnable.

Lead Acetate.—White: £146 10s. per ton.

Lead Carbonate.—Nominal.

Lead Nitrate.—£127 10s. per ton.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £154; orange lead, £166. Ground in oil: red, £173 10s.; orange, £185 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £161 per ton. Ground in oil: English, under 2 tons, £177 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82%, ton lots, d/d, £22 to £25 per ton.

Litharge.—£154 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £74 5s.; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £187; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 10s. 8d.; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 2d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 4d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1-ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £63 10s. per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 1½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d ; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots ; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 9⅝d. per lb. ; ground, 10⅝d. per lb., for not less than 6 cwt. ; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store ; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96%, 6-ton lots, £16 10s. per ton.

Potassium Iondide.—B.P., 15s. 5d. per lb. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7¼d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 6d. per lb. ; technical, £6 13s. to £7 13s. per cwt. ; according to quantity d/d.

Potassium Prussiate. Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s. per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER : 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £18 4s. per ton d/d.

Sodium Acetate.—£49-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb. ; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £29 12s. 6d. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100% basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £23 2s. 6d. a ton ; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb., in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £32 10s., anhydrous, £65 ; tri-sodium, crystalline, £32 10s., anhydrous, £64.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums ; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton ; pea crystals, £20 10s. per ton d/d station in kegs ; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £7 5s. 6d. to £8 5s. 6d. per ton ; 140° Tw., arsenic free £5 10s. per ton ; 140° Tw., arsenious, £5 2s. 6d. per ton ; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £10.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d (56-lb. bags), £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d ; white seal, £142 ; green seal, £141 ; red seal, £139 10s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£59 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 1/16d. to 1s. 5¾d. per lb. ; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £44 2s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 14s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £20 6s. 6d.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works : 90's, 3s. 3d. ; pure, 3s. 5¼d. ; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 1s. 1d. to 1s. 3d. per lb. Crude, 60's, 4s. 3d. MANCHESTER : Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 7d. to 10½d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 3s. 3d. per gal. ; 99.5/100%, 3s. 11d. American, duty free, for export, 9s. 0d., naked at works. MANCHESTER : Pale, 99/100%, American, duty free, 7s. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in [illegible] bags, £9 1s. to £12 13s. per ton according to m.p. ; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works ; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 90s. per ton f.o.r. suppliers' works ; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER : £5 10s. f.o.r.

Pyridine.—90/160°, 22s. 6d. MANCHESTER : 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal. MANCHESTER : Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton ; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal. ; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediate and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb. ; 66/68° C., 1s.

p-**Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb. ; P.G. 1s. 0½d. per lb.

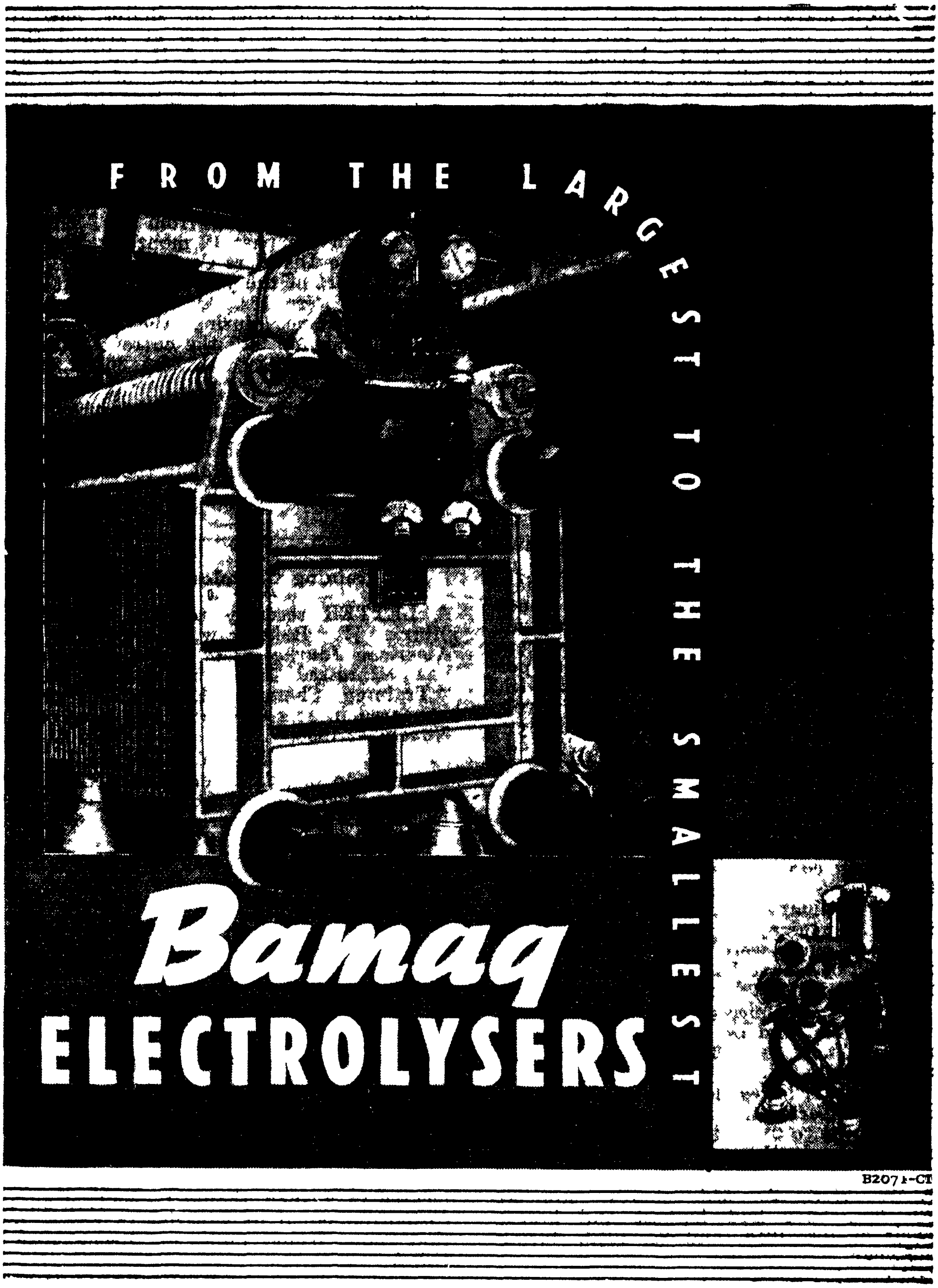
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

London: 22 December. The prices of unrefined oils remain unchanged for the four week period ending 1 January, 1951. The prices of refined oils remain unchanged for the eight week period ending 27 January, 1951.


FROM THE LARGEST TO THE SMALLEST
Bamag
ELECTROLYSERS

Chemical and Allied Stocks and Shares

STOCK markets have closed the year on a firm note, although international uncertainties restricted business and movements generally have been small and indefinite. Sentiment in regard to industrial shares remains under the influence of the various dividend increases announced recently by companies whose profits have expanded largely as a result of their drive in export markets. These increases are regarded as fully justified.

An end of the policy of rigid limitation of dividends is expected, but it is thought that Mr. Gaitskell will emphasise that in any case moderation and restraint in dividend payments must be followed. This would of course not rule out the prospect of somewhat higher payments from companies which have been able to increase earnings. There are indications, however, that companies which can earn more in 1951 will be the exception because higher taxation seems inevitable, moreover, the rising trend in prices of materials and commodities does not appear to have reached its peak.

The possibility of slightly higher dividends has tended to draw attention to some industrial shares and industrials generally are now at levels above those ruling at the end of 1949. In nearly all cases current prices are well below best levels reached in 1950. War Loan 3½ per cent is now 94¼, which compares with 92⅝ a year ago; highest and lowest levels in 1950 were 97 15/16 and 90 respectively.

Imperial Chemical, which were 42s. 9d. a year ago, are 42s. 7½d. at the time of writing; highest and lowest levels in 1950 have been 44s. 3d. and 39s. 6d. I.C.I. has made a big note issue during the year, but despite this increased capital, the market is confidently expecting that the 10 per cent dividend will be maintained on the ordinary shares. Monsanto were 51s. 3d. a year ago, and are now 50s. The year's extremes were 52s. and 46s. Fisons, now 25s. 6d., have had highest and lowest of 29s. and 19s. 3d. in the year.

Laporte Chemicals 5s. units moved between 11s. and 9s. 3d. during the year and are now 10s. 3d. Brotherton 10s. shares at 21s. 6d. are now at their highest for the year; lowest level in 1950 was 19s. Boake Roberts, now 33s., were, at one time, down to 25s. 6d. Albright & Wilson have moved between 31s. 10½d. and 27s. 10½d. in 1950 and are now 30s. 9d. F. W. Berk 2s. 6½d. shares, now at 12s. 6d., have had highest and lowest levels of 12s. 10½d. and 8s. 10½d. during the year.

Glaxo Laboratories 10s. shares, now at 59s. 3d. are closing 1950 at around the year's highest. Turner & Newall, now at 85s. 9d., have had extremes of 87s. and 73s. 3d. in the past 12 months; the shares have recently been active on the increased profits and higher payment to shareholders.

In the case of Boots Drug, which were 50s. 3d. a year ago and are now 48s. 9d., extremes have ranged from 51s. 3d. to 44s. 4½d. in the past 12 months. The 4s. units of the Distillers Co. at 19s. 4½d. are not far short of the year's highest; at one time they were 16s. 6d. Lever & Unilever's extremes during the year were 44s. 6d. and 37s. 9d., the current price of 41s. 9d. compares with 44s. 3d. a year ago.

Oil shares are tending to improve in response to market talk of higher dividend possibilities. Shell, now at 68s. 1½d. were 66s. 8d. a year ago; their extreme levels in the year were 70s. 3d. and 59s. 3d.

Training Chemical Engineers

A LETTER recently received from Mr. Morris W. Rakestraw, Editor of the American *Journal of Chemical Education*, has expressed interest in the leader "Training Chemical Engineers," which appeared in THE CHEMICAL AGE issue of 11 November 1950.

Mr. Rakestraw is helping to organise the programme of the International Congress of Pure and Applied Chemistry, which is to be held in New York, next September. He wishes to contact anyone in Great Britain who would like to take part in the Congress and discuss the training of chemical engineers in Great Britain.

Any readers who are interested and who might like to attend the Congress are invited to write to the Editor of THE CHEMICAL AGE.

European Atomic Plant

A scheme for the construction of a European laboratory for peaceful atomic research is to be considered by the Council of Europe. It is proposed that the laboratory, which would probably be located in France, should be centred on a cosmotron equal or superior in power to that now being built at Brookhaven, U.S.A.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the production of sulphonamides.—Ward, Blenkinsop & Co. Ltd., A. A. Goldberg and L. W. F. Salame. Feb. 10 1949. 648,467.

Production of fat-soluble vitamin concentrates.—Nopco Chemical Co. Feb. 17 1948. 648,649.

Production of porous metal plates.—Mond Nickel Co., Ltd., and M. A. Comley. March 21 1949. 648,415.

Recovery of insoluble solids from waste liquors.—Baker Platinum, Ltd., and I. Morgan. April 5 1949. 648,417.

Ferrous alloy having a high mechanical resistance at high temperatures.—Soc. Anon. Des Etablissements J. Holtzer. April 30, 1948. 648,422.

Production of organo-polysiloxanes.—Soc. Des Usines Chimiques Rhone-Poulenc. June 15 1948. 648,478.

Process of preparing organosiloxanes.—Dow Corning Corporation. June 22 1948. 648,480.

Production of alkylated alkylol melamines.—British Industrial Plastics, Ltd. June 24 1948. 648,481.

Aluminium solder and a method for the production thereof.—V. Tissot-Dagnette. June 28 1948. 648,482.

Apparatus for use in detecting the turbidity of liquids.—Permutit Co., Ltd. (Permutit Co.). June 29 1948. 648,485.

Plastic compositions, sheet materials made therefrom and processes for making such sheet materials.—E. I. Du Pont De Nemours & Co. June 30 1948. 648,485.

Production of ferric oxide.—General Electric Co., Ltd., D. M. Dovey, R. C. Chirnside and H. P. Rooksby. July 28 1949. 648,494.

Production of polyesters.—Courtaulds, Ltd., A. S. Carpenter, F. Reeder and E. R. Wallsgrove. Oct. 12 1949. 648.513.

Compositions having fungicidal and/or fungistatic properties.—Scientific Oil Compounding Co., Inc. Nov. 5 1948. 648,518.

Germanium rectifiers. — Westinghouse Brake & Signal Co., Ltd., A. Jenkins and K. A. Garrod. Oct. 27 1949. 648,186.

Contacting finely divided solids with gases.—Standard Oil Development Co. Dec. 14 1948. 648,198.

Treatment of metal sulphates.—J. A. Reavell. Aug. 19 1949. 648,528.

Vitreous seals, particularly among glasses, ceramics, refractories and metals. —S. H. Parsonage. Dec. 21 1949. 648,289.

Method of and apparatus for, carrying out chemical reactions.—Compagnie Francaise de Raffinage. Dec. 7 1945. 647,705.

Heat-treatment of cobalt-chromium-nickel-base alloys.—Elgin National Watch Co. May 17 1946. 647,760.

Process and apparatus for the manufacture of multicellular glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny, & Cirey. Aug. 1 1946. 647,763.

Waterproof coatings.—Soc. des Usines Chimiques Rhone-Poulenc. Oct. 4 1946. 647,718.

Hydrophilic sheet materials impregnated with a combined plasticiser and fire-retardant and method of producing the same.—G. F. Rayner (American Viscose Corporation). Oct. 16 1946. 647,582.

Methods of imparting fluorescent effects to materials.—Lever Bros. & Unilever, Ltd., L. N. Savidge and R. Thomas. March 25 1948. 647,718.

Methods for producing articles sheathed with thermoplastic material.—Extruded Plastics, Inc. May 7 1947. 647,644.

Electrolytic production of chlorates.—Pennsylvania Salt Manufacturing Co. May 20 1947. 647,719.

Degreasing, pickling, and passivation of metals.—H. M. Freud. June 24 1947. 647,782.

Manufacture of refractory products and abrasives. — Electro-refractaire. July 8 1947. 647,721.

Extraction of vanadium and phosphorus from salt residues.—Montecatini Soc. Generale per l'Industria Mineraria E. Chimico. July 21 1947. 647,588.

Thermoplastic polymers.—British Celanese. Ltd. Aug. 12 1947. 647,727.

Polymerisation of dienes.—B. F. Goodrich Co. Aug. 26 1947. 647,729.

Means for controlling the temperature of hot gases.—J. Lucas, Ltd., R. J. Ifield, and J. J. Righton. Oct. 1 1948. 647,648.

Cracking or otherwise treating hydrocarbons.—Houdry Process Corporation. Oct. 21 1947. 647,591.

Means for controlling the temperature of hot gases in combustion-chambers.—J. Lucas, Ltd., and E. A. Watson. Oct. 13 1948. 647,830.

Manufacture of chlorinated rubber.—Dunlop Rubber Co., Ltd., M. Gordon, and R. M. Everett. Oct. 27 1948. 647,732.

Reactivation of spent media from the purification of liquids with activated magnesia.—J. J. Naugle. Nov. 7 1947. 647,784.

Process for the adherence of aluminium and other metallic coatings to metallic surfaces.—W. P. Williams (Armco International Corporation). Dec. 8 1947. 647,652.

Apparatus for detecting or registering chemical characteristics of liquids.—Wallace & Tiernan Products, Inc. Dec. 11 1947. 647,739.

Electrical cell apparatus for detecting chemical characteristics of liquids.—Wallace & Tiernan Products, Inc. Dec. 15 1947. 647,740.

Process and apparatus for the manufacture of ammonium sulphate crystals.—C. Otto. Dec. 17 1947. 647,742.

Purification of gaseous mixtures and apparatus therefor.—Elliott Co. Dec 19 1947. 647,654.

Manufacture of glue.—E. Kolle. Dec. 24 1947. 647,796.

Process for heat-treating ferrous metals and products obtained therefrom.—L. Levitsky. Dec. 24 1947. 647,797.

Process for the direct manufacture of concentrated nitric acid from the gases of the combustion of ammonia.—P. Guareschi, L. Pettenati, and G. Maragliano. Dec. 31 1947. 647,594.

Basic alkyl esters and the preparation thereof.—F. F. Blickie. Feb. 28 1948. 647,846.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

DESIGN ENGINEERS, with B.Sc. Degree in Mechanical Engineering or equivalent, and not over 40 years of age, are required by The Bahrein Petroleum Company, Limited. Experience to have been in design of Oil Refineries, coal tar, chemical distillation or similar plants. involving electrical and steam systems, pressure vessels, fractionating columns, heat exchange and pumping equipment. Salaries according to qualifications and experience, plus kit allowance. Provident Fund. Free board and air-conditioned accommodation, medical attention. Low living costs. Two-year agreements with paid leaves and transportation. Write, giving full particulars of age, education and experience, to **Box 3785, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

OIL Refinery Contractors handling large contracts for Refinery Plant, require **CONTRACT ENGINEERS** in their London Office. Duties involve broad direction and co-ordination of all phases of the work, including planning, drafting, purchasing, progressing and erection. Desirable qualification is previous experience of Refining Industry or Heavy Engineering, including a wide knowledge of pumping, heat-exchange equipment and instrumentation, and the appointment offers excellent prospects to suitable men. Applicants should write fully, stating qualifications, age and experience, to **Foster Wheeler, Ltd., 3, Ixworth Place, London, S.W.3.**

PLANT DEVELOPMENT AND PROCESS ENGINEERS, qualified in Chemical Engineering or Petroleum Refining Technology, required by Bahrein Petroleum Company, Limited. Age limit, 25-40. Two-year agreement periods with passages and paid leaves. Free air-conditioned accommodation, board and medical attention; kit allowance, low living costs. Salary according to experience. Write, with full particulars of age, education, experience, to **Box 3784, c/o Charles Barker & Sons, Ltd. 31, Budge Row, London, E.C.4.**

WORKS CHEMISTS AND TECHNICAL ASSISTANTS are required by the Division of Atomic Energy (Production) at Windscale Works, Sellafield, Cumberland, and Springfields Factory, Salwick, nr. Preston. The work involves the control of novel and complex chemical processes, many of which are still under development. Candidates must have either an Honours Degree in Chemistry, Metallurgy or Chemical Engineering, Associateship of the Royal Institute of Chemistry, or the Institution of Metallurgists, Corporate Membership of the Institute of Chemical Engineers, or equivalent qualifications. Candidates need have no specialised knowledge of the chemistry of radio-active elements. Facilities exist for training in factory administration and there will be opportunities for promotion.

Salary for Works Chemists will be assessed according to age and experience, within the range £330-£720 per annum, and for Technical Assistants according to age, within the range £330-£570 per annum.

Applications to **Ministry of Supply, D.At.En. (P), Risley, nr. Warrington, Lancs.,** stating post applied for and location preferred.
RS.3305-JO-20.

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FOR SALE

VARIOUS MIXERS FOR SALE

BAND CONVEYOR, 50 ft. long 40 in. wide, steel frame, motorised, for boxes, cases, bags, etc.

A FILTER PRESS, 31½ in. square, fitted with 42 C.I. plates, centre fed.

FILTER PRESS, 25 in. square, fitted with 24 plates, cast iron built and steam heated.

Four **GARDNER HORIZONTAL MIXERS,** for powders, from 100 lbs. to 250 lbs. capacity, all motorised, three with Radicon Reduction Gear Boxes and one with a Spur Gear Drive.

Two large unjacketed **WERNER MIXERS,** belt and gear driven, hand tipping, double "Z" arms, pans 53 in. by 45 in. by 36 in. deep.

No. 200 One nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR** Low type, with C.I. built mixing chamber 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft by 6 ft. by 4 ft. high to the top of the tipping screw.

No. 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3 ft. 3 in. deep, with horizontal shaft, fitted with bolted-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application.

Write **RICHARD SIZER LIMITED, ENGINEER. CUBER WORKS, HULL**